TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES

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I hereby declare that the thesis entitled "**TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES**" submitted towards partial fulfillment of the requirements for the award of **M.S in Surgery** degree to BFUHS is a compilation of original work carried out by me under the supervision of Dr Chiranjiv Singh Gill, Professor, Dr. Ashvind Bawa, Associate Professor, Department of Surgery. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated

to

my Family

&

Teachers

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LIST OF ABBREVIATIONS

MODS-	Multiple organ dysfunction syndromes
REEA-	Resection and End to End anastomosis
DM-	Diabetes Mellitus
IBD-	Inflammatory Bowel Disease
PO-	Post-operative
P-value-	Probability Value
PC-	Primary Closure
SD-	Standard Variation
HS-	Handsewn anastomosis
SA-	Stapler anastomosis
SSI-	Suture site infection

Abstract

Introduction- An anastomosis becomes necessary when a segment of the gastrointestinal tract is resected during surgery and continuity needs to be restored. Two most commonly used techniques are hand sewn anastomosis and stapler anastomosis. The fate of anastomosis and the PO complications like intestinal anastomosis include anastomotic leak, bleeding, wound infection; prolonged functional ileus depends on type of anastomosis, surgical technique, habitus of patient, co-morbidities, etc.

Aim: To observe the results of using stapler in comparison to handsewn anastomosis for wound infection, postoperative complications, postoperative recovery and anastomotic leak within 1 month of anastomosis.

• Material & Methods: This prospective study was conducted in Dayanand Medical College and Hospital; Ludhiana on patients admitted for small intestine surgeries from 1st Dec 2019 to 31st May 2021 and after that 1 month follows up upto 30th June 2021. The following study was carried out on 34 patients in whom stapler anastomosis was done and 27 with hand-sewn anastomosis.

• Results- there was no significant difference in anastomotic failure rate which was 15% in stapler anastomosis and 11% in handsewn anastomosis group (p value- 0.68). The mean operating time was about 20 mins lesser in stapled anastomosis group (p value-0.001). the return of bowel sounds and return to work were also significantly earlier with stapled anastomosis. While the resumption of feed and hospital stay was not significantly favourable in stapler anastomosis group but had relatively earlier resumption of feed and shorter hospital stay in stapler anastomosis group.

Conclusion: Hence, we conclude that if staplers are used for small bowel anastomosis technique then there is decreased mean operating time, earlier return of bowel sounds which results in earlier resumption of feed, decreased duration of hospital stay and earlier return to work. Though there is no difference in anastomotic leak incidence. Thus, the use of staplers may be considered as a better option for anastomosis.

• Key words: anastomotic leak, return of bowel sounds, resumption of feed, hospital stay

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Introduction

An anastomosis becomes necessary when a segment of the gastrointestinal tract is resected during surgery and continuity needs to be restored. Surgical resection of bowel segment is considered as the main step during celiotomies for treating perforation, gangrenous segments, vovulus (resulting in ischemic and pre-gangrenous intestinal wall), tumors, malignancies, intussusceptions, intractable bleeding ulcers. Anastomotic procedure is one of the key factors in determining surgical success and early recovery of the patient.[1]

For a successful anastomosis general condition of the patient needs to be adequate in order to have a good healing process- like good nutritional status, with no systemic illness causing immunosuppression which leads to delayed or failure of healing, no fecal or purulent contamination, gentle tissue handling to prevent enterotomies and serosal injuries and weakening of tissues, adequate vascularisation of tissues, hemostasis, and proper surgical technique besides other factors.[2]

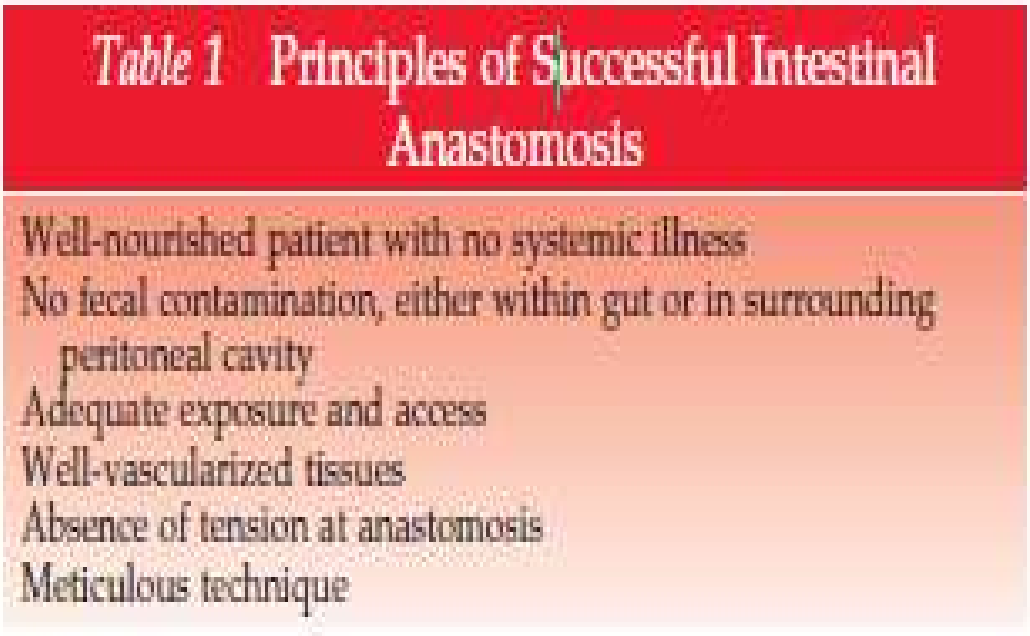


Table 1 Principles of Successful Intestinal Anastomosis
Well-nourished patient with no systemic illness
No fecal contamination, either within gut or in surrounding peritoneal cavity
Adequate exposure and access
Well-vascularized tissues
Absence of tension at anastomosis
Meticulous technique

Important complications following intestinal anastomosis include anastomotic leak, bleeding, wound infection, prolonged functional ileus, enterocutaneous fistula formation, systemic sepsis, MODS, anastomotic site stricture.

Hand-sewn and Stapled anastomosis are two types of anastomotic methods used during gastrointestinal surgeries (elective/emergency). The aim of this prospective study is to observe the results of using stapler in comparison to handsewn anastomosis for complications like wound infection and anastomotic leak within 1 month of anastomosis and also to evaluate which is better in terms of post operative recovery, duration of hospital stay.

Traditionally, a wide variety of suture materials have been used to create handsewn anastomosis. Although, surgical stapling devices have existed since the 20th century, their use in the routine gastrointestinal surgery has been since then.

Today, stapled anastomosis is an integral part of most major abdominal surgeries. Numerous studies have compared the clinical and laboratory features of handsewn and stapled anastomosis.

There has been a lack of studies comparing superiority in general surgeries of digestive tract between stapler and handsewn anastomosis. A few studies show that in ileocolic surgeries, stapled anastomosis was associated with fewer leaks than handsewn anastomosis although

there was no difference for stricture formation, anastomotic time, re-operation rate, mortality rate, or intra-abdominal abscess formation.

Stapled technique significantly shortened the duration of surgery compared to conventional handsewn suturing technique. Shortening of the operative time means reducing surgical trauma due to decreased tissue handling and decreased intraoperative blood loss. This also decreases local infection and reduces the chance of surgical complications.

With the advent of modern devices like staplers, anastomotic dehiscence are rare, as the staplers are of more consistent quality, and anastomosis can be done in difficult to reach sites too.[40]

In the hand sewn anastomosis, which is done with surgical sutures using mainly polyglactin, polydiaxonone and silk. Either continuous or interrupted suturing can be done. Also the anastomosis can be either single layered or double layered.

Staplers were originally developed to address the perceived problem of patency (security against leakage of blood or bowel contents) in anastomoses in particular.[1]

Understanding how staplers interact with target tissues is key to improving patient outcomes. Staples in surgical staplers are of various sizes and heights so surgeon makes a choice about the appropriate stapler to apply according to the condition and site of stapler to fire upon; also considering about hemostasis/ tissue apposition without significant ischemia or tissue destruction. For example – if the closed staple height is too high it may lead to leak, bleeding or dehiscence of the anastomosis. Conversely, if the staple height that is used is too low, then ischemia, serosal shearing, or “cheese wiring” may result, potentially leading to leakage or frank necrosis. There are atleast three staple heights for most linear staplers.[3]

The various advances have made the use of staplers easy and cost effective. So, nowadays staplers are used commonly for anastomosis. So various studies are being conducted to compare the overall operative and

postoperative benefits of either anastomotic technique which helps the surgeons to decide which anastomosis to prefer for a particular intraoperative finding and site.

AIMS AND OBJECTIVES

To observe the results of using stapler in comparison to handsewn anastomosis for wound infection, postoperative complications, postoperative recovery and anastomotic leak within 1 month of anastomosis.

REVIEW OF LITERATURE

HISTORY OF ANASTOMOSIS

The word anastomosis comes from the Greek word ‘ana’ i.e. without, and ‘stoma ‘i.e mouth. An intestinal anastomosis becomes necessary when a segment of gastrointestine is resected and gastrointestinal continuity has to be restored. The art of bowel anastomosis dates back to the 19th century.[1] Late in 19th century, Billroth and colleagues conducted the first successful manual anastomosis in the intestinal surgery.

Intestinal anastomosis dates back to 1000 B.C., the era of Sushruta ” The Great Indian Surgeon” he described the use of black ants during the suturing of intestinal anastomosis.[5] Egyptian used linen and animal sinew to close wounds. In 1826, Antoine Lembert, proposed concept of serosal apposition. Cushing and Connell gave the concept of continuous inverting suture technique.[4] Nicolas Senn’s review (1844-1908, Chicago) performed in 1893 detected approximately 60 different techniques for intestinal suture.[1]

Within the past 200 years, gastrointestinal anastomosis has been transformed from a life threatening venture into a safe and routinely performed procedure. Importance of serosa apposition introduced by Antoine Lembert (1802-1851) in 1826(2) and the concept of asepsis was proposed by Lord Joseph Lister (1972-1912) in 1867.[6] Currently a single layer of extramucosal anastomosis is popular, as advocated by Matheson Aberdeen, as it probably causes the least tissue necrosis or luminal narrowing.[7]

The invention of stapler for bowel anastomosis was a major advancement seen for performing bowel anastomosis. First popular stapling prototype was described in 1892 by Murphy Button.[6]

Ravitch’s introduction of a modified form of the Russian stapling device and advent of biofragmental anastomosis rings in 1985 by Thomas G Hardy led to the resurgence of sutureless anastomosis around the world. [8-9]

First stapling device was introduced in 1908 by Humer Hulti which resulted in advent of new technique for anastomosis that is stapled anastomosis. Since then this method is referred to as “mechanical suturing”. This stapler was later modified by Alader Petz, a student of Hulti who created a lightweight model which was called as “Petz clamp”. In 1934, Freidrich of Ulm designed a predecessor of the modern –day linear stapler.[10]

In 1950s, Russian and American staplers emerged. By 1960s, staplers were being manufactured by the United States Surgical Corporation. In 1970s, Johnson and Johnson Ethicon brand started marketing staplers. Covidien came in around 2007. [11]

FACTORS IN ANASTOMOTIC HEALING

In 1882, Halsted stated that submucosal layer was the main factor responsible for resistance of anastomosis due to abundant collagen content within the layer. Also Halsted emphasized the importance of avoiding penetration into the lumen to protect the suture tract from contamination by the intraluminal contents.[12] Beside surgical-technical (suture technique, suture material) and surgical-tactical factors (primary anastomosis vs. discontinuity resection or formation of protecting diverting stomas) knowledge of the various endogenous (diabetes, sepsis, infection, malnutrition) and exogenous factors (steroids, radiation, preoperative bowel preparation) influencing anastomotic healing is essential.[13]

There are three phases of intestinal anastomosis healing:

<A> acute inflammatory phase (lag)

<B> proliferative phase, and

<C> remodeling or maturation phase.[14]

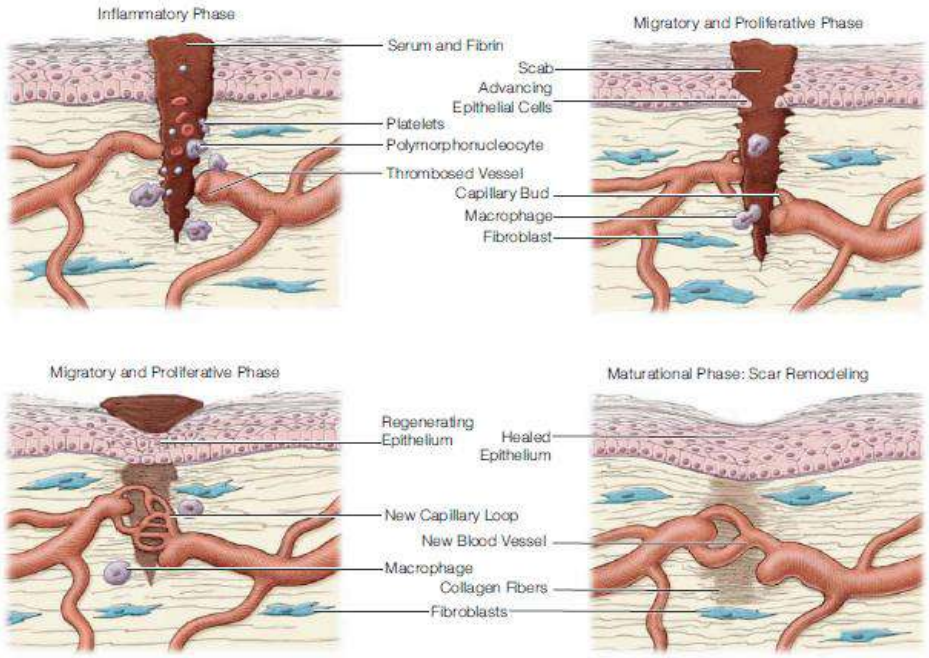


Figure 1 **The phases of wound healing. In the inflammatory phase (*top, left*), platelets adhere to collagen exposed by damage to blood vessels to form a plug. The intrinsic and extrinsic pathways of the coagulation cascade generate fibrin, which combines with platelets to form a clot in the injured area. Initial local vasoconstriction is followed by vasodilatation mediated by histamine, prostaglandins, serotonin, and kinins. Neutrophils are the predominant inflammatory cells (a polymorphonucleocyte is shown here). In the migratory and proliferative phase (*top, right; bottom, left*), fibrin and fibronectin are the primary components of the provisional extracellular matrix. Macrophages, fibroblasts, and other mesenchymal cells migrate into the wound area. Gradually, macrophages replace neutrophils as the predominant inflammatory cells. Angiogenic factors induce the development of new blood vessels as capillaries. Epithelial cells advance across the wound bed. Wound tensile strength increases as collagen produced by fibroblasts replaces fibrin. Myofibroblasts induce wound contraction. In the maturational phase (*bottom, right*), scar remodeling occurs. The overall level of collagen in the wound plateaus; old collagen is broken down as new collagen is produced. The number of cross-links between collagen molecules increases, and the new collagen fibers are aligned so as to yield an increase in wound tensile strength.**

Serosal layer i.e the visceral peritoneum of bowel holds suture better than the muscular layer of bowel. So, due to absence of a peritoneal layer the anastomosis made in the thoracic esophagus and rectum below the peritoneal reflection is technically difficult and weaker as compared to intestinal anastomosis.[15]

Also the difference in vascularity is also related to healing such that the stomach and intestine heals faster being more vascularised in comparison to esophagus and large bowel.[15]

FACTORS IN ANASTOMOTIC FAILURE

Leakage of intestinal contents into the abdominal cavity or peritoneal cavity is the most feared and most significant surgical PO complication. Failure rates ranges from 1-24% which depends on technique used for anastomosis (handsewn vs stapler), also the setting in which the surgery was performed i.e. emergency or elective surgery.[15]

Leak rate depends on factors like location and systemic factors. As a rule, for any given technique site does not significantly influence the failure of anastomosis. Two exceptions to this rule are – first- low anterior rectal anastomosis are associated with higher leakage rates ranging from 12-19%.[17] Second- leak rate of esophageal anastomosis when done using stapler was about 3%.[18]

On the other hand, sepsis, anemia, DM, previous irradiation or chemotherapy, malnutrition, vitamin deficiencies, steroid use, and certain conditions like IBD, Crohn's disease are various systemic factors associated with poor anastomotic healing and increased anastomotic leak rates.[19]

Septic shock leads to impaired perfusion, inadequate collagen synthesis and epithelialisation, which ultimately leads to anastomotic failure. Malnutrition is related to decreased collagen production as well. Anastomosis made in patients with Crohn's disease carries a risk of 2-12% leak rate.[19]

Smoking and heavy alcohol consumption is also associated with leak.[20]

Laying emphasis over the operative aspect, it has been noted that the rate of fecal fistula formation was far higher in the group that had everted suture anastomosis (43%) than in the group with inverted suture anastomosis(8%).[21]

An important fact that came into light recently was that hypothermia can cause anastomotic failure by causing vasoconstriction resulting in tissue hypoxia and increased bacterial load.[22]

Table 2 Consequences of Postoperative Dehiscence

Peritonitis
Septicemia
Further surgery
Creation of a defunctioning stoma
Death

The choice of anastomotic technique may be influenced by the diameter of bowel ends, oedema, accessibility and underlying pathology, site, duration of symptoms, septic component, and general status of patient.

Table 11 Salvage after Anastomotic Leakage

Close monitoring
Daily blood tests, including CRP
Early investigations: CT (with rectal contrast for left-sided anastomoses)
Early reoperation if concern
Consider options:
Takedown of anastomoses and end stoma
Resuture small defect with abdominal drainage and upstream stoma
If low rectal anastomosis, then transanal assessment with use of VAC endosponge to manage pelvic sepsis

CRP = C-reactive protein; CT = computed tomography; VAC = vacuum-assisted closure.

Anastomitic Techniques

Anastomosis can be described as follows:

Sutured –

1. Interrupted or continuous;
2. Single or two - layer;
3. End-to-end or side-to-side (or any combination);
4. Extramucosal or full thickness sutures; and
5. On basis of site of anastomosis and type of suture material used.

Stapled:

1. Side-to-side or end-to-end (or any combination);
2. Staple lines over sewn, buried or not;
3. Stapling device used.

Table 12 Standard Checks for Creation of Anastomoses

Any tension?
Any rotation of the mesentery?
Vascularity?
Are the doughnuts complete (for circular stapling devices)?
Leak test?
Need for defunctioning?

Suture Technique-

a. Two stay sutures are placed over cut ends of small bowel to be anatomized.
b. These ends are held under slight tension by the assistant through the hemostats applied over the sutures.
c. Now the pattern in which the surgeon wants to anastomose is done like double layer suturing technique in which a single layer of interrupted suturing done where sutures are placed approximately 5 mm apart and 3 mm from the wound edges.

The first layer can be closed in continuous type pattern too via Cushing pattern and Connell suture patterns. Both of these techniques are inverting type of suturing technique.

d. The intestine is cleansed of all fecal matter before the anastomotic procedure is done.

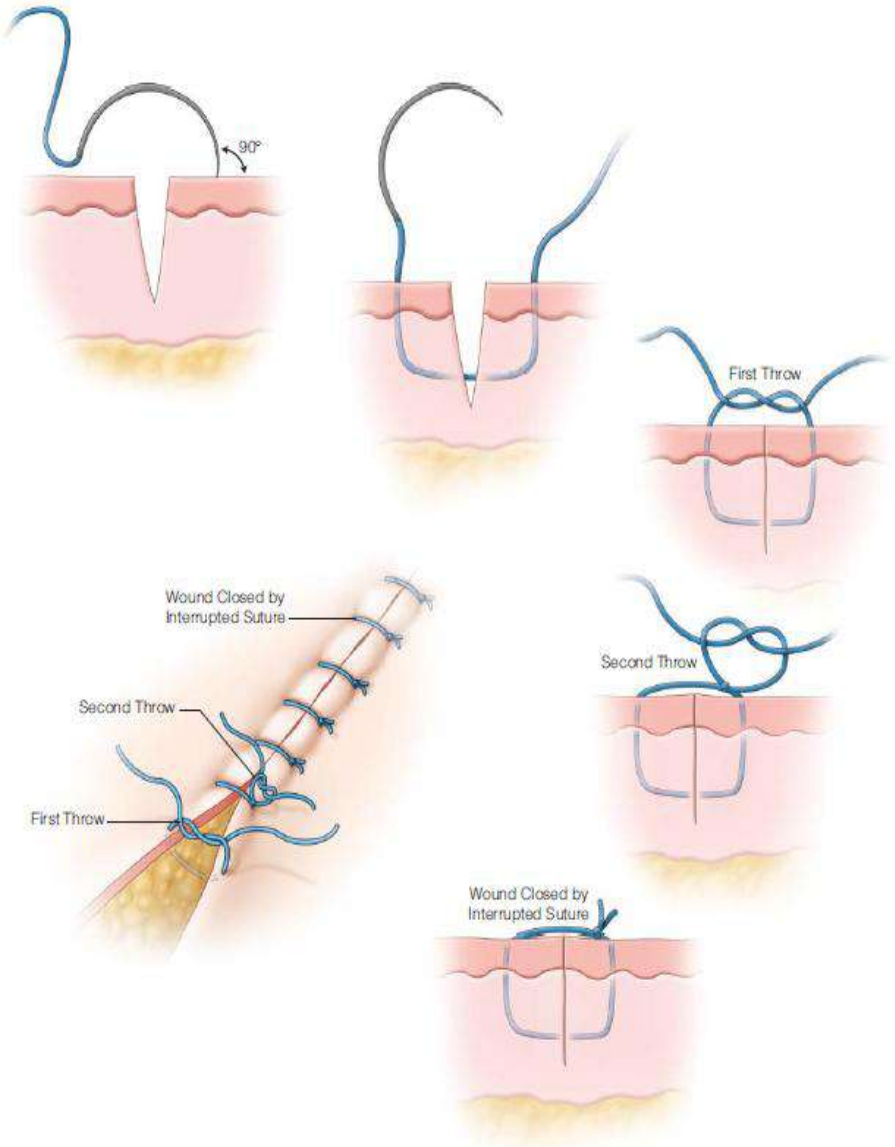


Figure 3 **A simple interrupted suture technique is useful for easy closure of traumatic and surgical wounds. Begin by entering the skin with the needle at a 90° angle to the skin. Full-thickness tissue bites encompass the epidermis and dermis. The first throw of the knot is a surgeon's knot, and all subsequent knots should lie squarely on the previous knot. The sutures should be spaced close enough to coapt the tissues but not cause ischemia.**

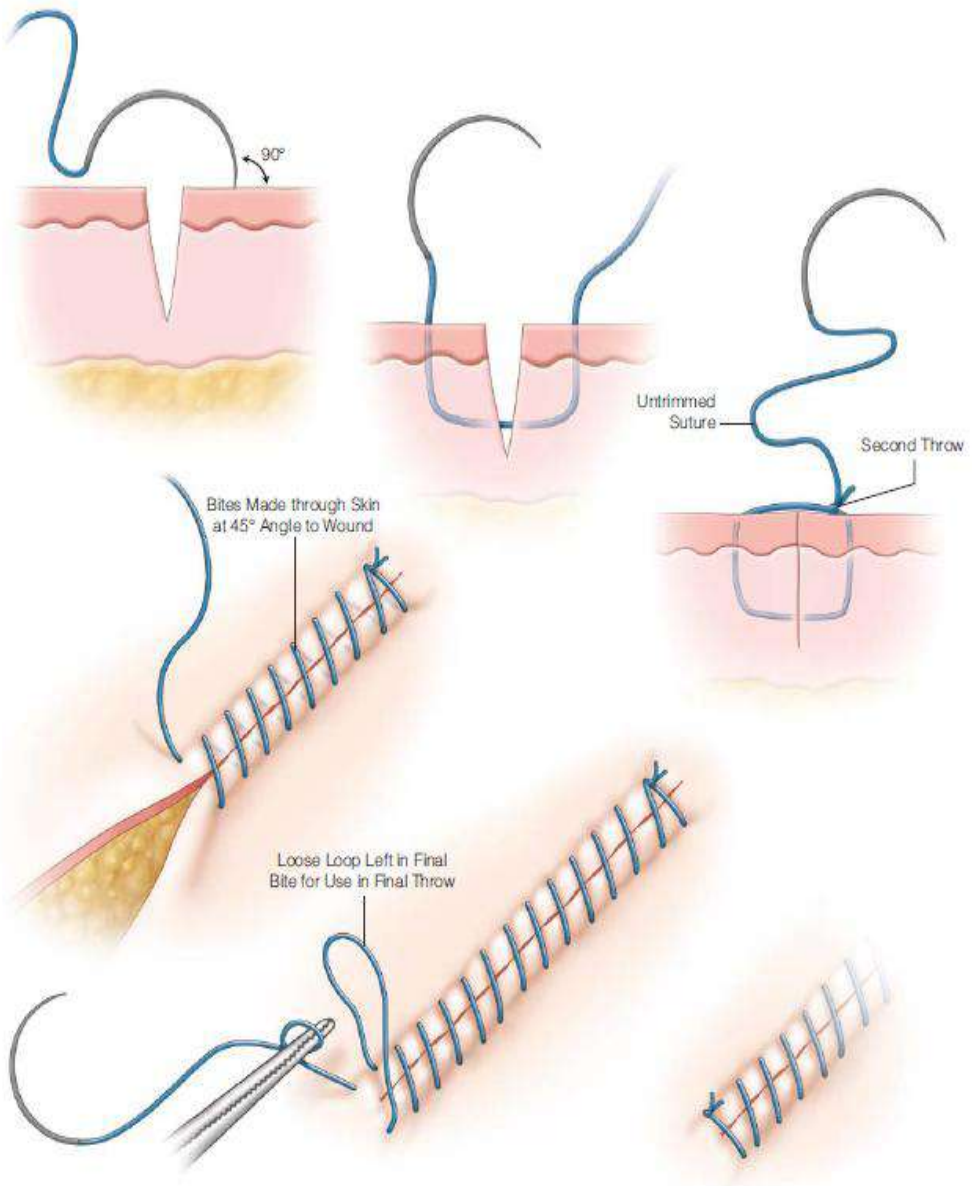

90°
Untrimmed Suture
Second Throw
Bites Made through Skin at 45° Angle to Wound
Loose Loop Left in Final Bite for Use in Final Throw

Figure 4 **A simple continuous suture technique is a faster alternative to the interrupted suture technique described in Figure 3 [*see Figure 3*]. The first bite is secured with knots, and the remaining bites continue in a repetitive fashion at equal distances, close enough to coapt tissues without inducing ischemia. In the final bite of tissue, a loose loop is left to use as one of the suture ends for the final knot to secure the suture.**

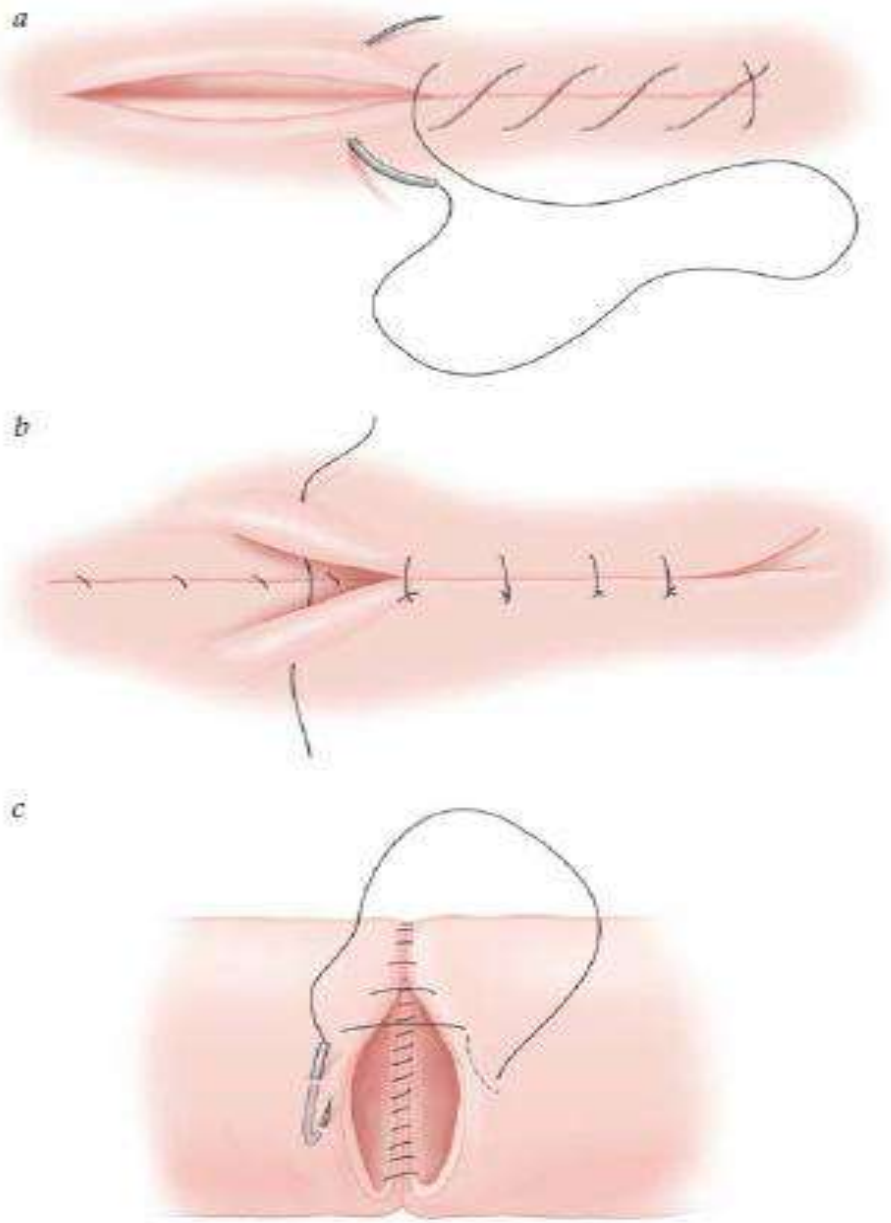


Figure 5 **Stitches commonly used in fashioning intestinal anastomoses: (*a*) the continuous over-and-over suture, (*b*) the interrupted Lembert suture, and (*c*) the Connell suture.**

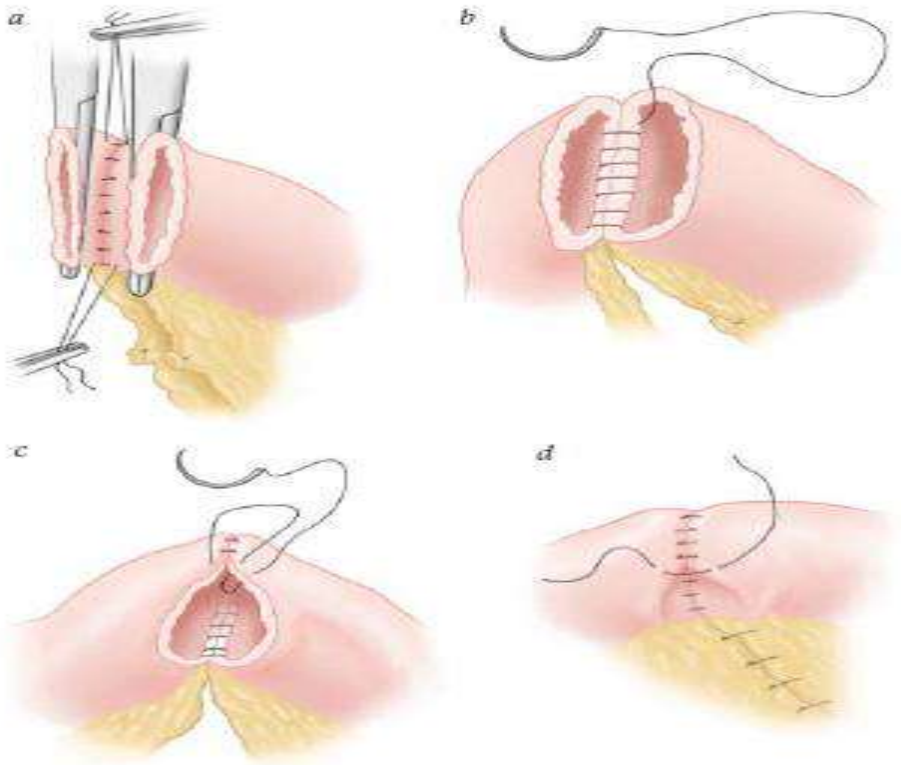


Figure 6 **Double-layer end-to-end anastomosis. (*a*) Interrupted Lembert stitches are used to form the posterior outer layer. (*b*) A full-thickness continuous over-and-over stitch is used to form the posterior inner layer. (*c*) A Connell stitch is used to form the anterior inner layer. (*d*) Interrupted Lembert stitches are used to form the anterior outer layer.**

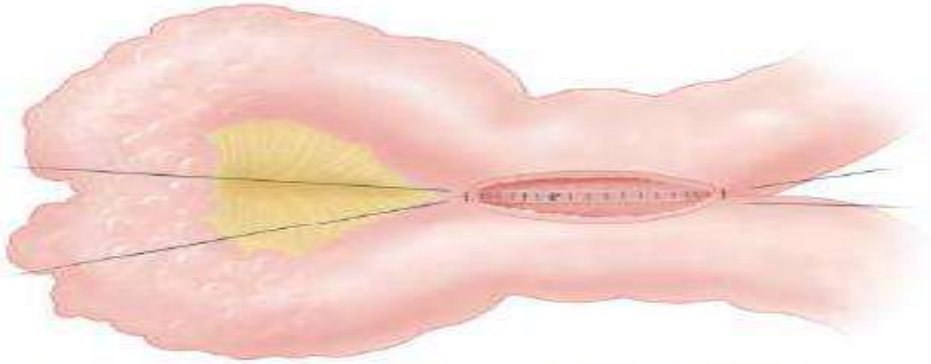


Figure 9 **Single-layer sutured extramucosal side-to-side enteroenterostomy. A full-length suture is started in the back wall and run through the seromuscular and submucosal layers in the direction of the surgeon; the corners of the enterotomy are approximated with a baseball stitch, and a single Connell stitch is used to invert the anterior layer. A second suture is started at the same spot on the posterior wall and run in the opposite direction, again through all layers except the mucosa; the corners of the enterotomies are approximated with a baseball stitch, and the suture is continued in either the Connell stitch or the over-and-over stitch to complete the anterior wall of the anastomosis.**

Stapling technique-

Done using a ‘Double-Staple Technique’ – this technique was developed in 1980 by Knight and Griffen

Advantages of this technique of anastomosis-

1) Lesser contamination

2) Technically easier anastomosis

3) Different diameters can be anastomosed efficiently.[23]

Table 4 Anastomotic Techniques Ranked by Best Blood Flow to the Healing Site[33]
1. Stapled anastomoses in which the staple height was adjusted to the thickness of the bowel wall
2. Double-layer stapled and sutured anastomoses
3. Double-layer sutured anastomoses
4. Tightly stapled anastomoses

HISTORY OF STAPLERS

Since their development in 1908, surgical staplers have been used as a method of “mechanical suturing” in an effort to divide hollow viscera and create an anastomosis in an efficient and sterile manner.

The concept for the surgical stapler was first developed by Humer Hulti, a Hungarian professor and surgeon, and designed by Victor Fischer. This design was bulky, cumbersome and not cost effective. So,In 1920, Aladar Petz , a student of Hulti, modified this stapler to a more lightweight model which was called ‘Petz Clamp’.[24]

Finally in 1950s Russian and American staplers emerged. In 1970s, Johnson and Johnson Ethicon brand came into the market. The US Surgical Corporation was later bought by Tyco Health care and renamed to Covidien in 2007.[24]

Felicien Steichen, Mark Ravitch, and Leon Hirsch, modified the surgical staplers further like invention of interchangeable cartridges and different designs of staplers. Also staplers for minimally invasive surgery, vascular staplers are available nowadays.[24]

TYPES OF STAPLERS

Latest staplers in use are disposable and reliable. The broad range of devices used for mechanical suturing are:

Circular staplers

Linear staplers

Linear cutter staplers

Disposable circular staplers

Uses- end to end anastomosis; side to end anastomosis; side to side anastomosis; thoracic surgery; bariatric surgery; colorectal surgery.

Size- varying diameters-

Curved type- 21 mm to 33 mm

Straight type- 33mm to 36mm

The stapler has titanium staples which are circularly staggered and are arranged in two concentric rings inside the staples containing cartridges, the circular staples cuts automatically any tissue during release and create circular anastomosis. The circular staplers can be easily operated by a squeeze in a trigger handle.

Disposable linear stapler

Used in various abdominal surgeries, many sizes are available from 30 mm to 90mm. Two staple heights are available for each size of the stapler, which through the control pressure facilitate anastomosis of thick tissues.

The linear stapler contains two staggered rows of titanium staples.

The stapler can be easily operated by the squeeze of the trigger handle. The effective length of anastomosis is defined by the size of selected stapler.

Appropriate cartridges that can be used with the linear staplers ensure cost-effectiveness as single-patient use of the product is advisable.

Disposable linear cutting stapler

Mainly this type of stapler is used in REEA of the bowel. It is available in various sizes of 50 to 100mm (effective length of anastomosis and resection of bowel loops).

Two staple heights are available for each size stapler which facilitates anastomosis and resection of both thick and thin tissues.

The linear cutting stapler is loaded with two staggered rows of titanium staples and simultaneously cuts and divides the tissue between the two double rows. Sharp knife is built into the stapler body.

The stapler can easily be operated by complete squeeze of the hands followed by shifting of side knob forth and back.

Built-in cam, distance pin and precise closing mechanism co-work to facilitate parallel jaws closing followed by proper staples formation.

The effective length of anastomosis and transection is defined by the size of selected stapler.

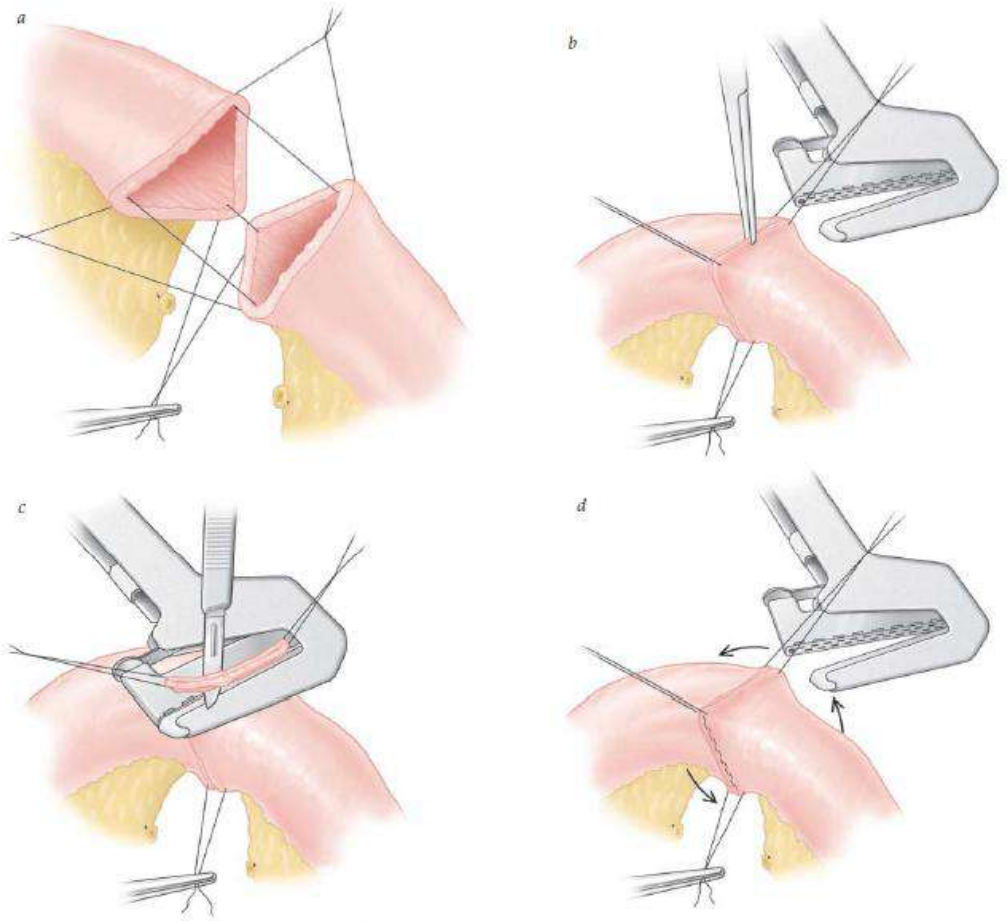


Figure 7 (*a*) The bowel ends are triangulated with three traction sutures. (*b*) A noncutting linear stapler (transverse anastomosis) is placed between two of the sutures. (*c*) The stapler is closed, and the excess tissue is excised. (*d*) The bowel is rotated, and steps *b* and *c* are repeated twice more to close the remaining two sides of the triangle.

Surgical sutures

The sutures were first used in 3000 B.C. Egyptians used various materials like plant fibres, hair, tendons and wool threads which were remains of mummies.[25] The first document 'Samhita' was written by the Indian surgeon Susruta in 500 B.C.[26] He described the use of bowstring made of upper small intestine of sheep for operations like rhinoplasty, tonsillectomy, amputation, and repair of anal fistulae.

Back then catgut was used by musicians for stringed instruments and the process of creating bow strings for musical instruments was called 'kitgat' meaning fiddle string. 'Kit' is a three-stringed violin from which the name 'catgut' came.[26] The use of braided suture was described by Aurelius

Cornelius Celsus.[27] He wrote about hemostasis via ligatures which twist around vessels.[27]

Avicenna described a natural monofilament suture made of pig's bristles and the use of a loop of suture for abdominal closure, which avoids the weakest part of a suture, the knot.[28]

Physick noted and stated that sutures that dissolved would be helpful so he popularized chromic sutures.[29]

James Marion Sims (1813-1884) used silver wire for repairing vesicovaginal fistula.[30] Silver suture was employed for closing tissue under tension, for infected surgical fields, and for fistulas.[31] Metal sutures have high tensile strength but were difficult to tie.[32] The use of silver sutures declined by the advent of synthetic non-absorbable sutures.

Presently, stainless steel is used only in a few gynaecology procedures and rarely in closing complicated anterior abdominal wall as retention sutures.[33]

Lord Joseph Lister was the first to correlate presence of germs and infection after which the suture ends which were left long from the wounds were cut to prevent infection.[30] Lister developed chromic catgut in 1881.[33] By 1960s, there were about 40 new synthetic absorbable polymers including polyglycolic acid and polylactic acid.[34-35]

Synthetic sutures are named based on the corporation, materials, or scientists who formulated them. For example- Ethibond is the trade name for a polyester suture with a coating that is tightly bonded to the suture made by Ethicon. The suture coating is also being medicated with antibiotics to prevent surgical site infections.

Key contributions include Celsus inventing the use of suture ligatures for hemostasis and sterilization of suture by Lister.[35]

CLASSIFICATION OF SUTURE MATERIALS

Absorbable

Natural- catgut-plain, or chromic catgut

Synthetic- polyglactin(vicryl), polyglycolic acid(dexon)

Non-absorbable

Natural- Silk linen

Synthetic- Polyamide (nylon), polyester(Dacron), polypropylene(prolene)

SURGICAL GUT

These sutures are derived from naturally occurring purified connective tissue (mostly collagen) of the small intestine of sheep and cattle. Surgical gut is absorbed by proteolytic enzymatic degradation.[36] About 60% of strength of this suture is lost in 7 days and completely dissolves in 14 days whereas chromic salts can delay this absorption process.[37]

POLYGLYCOLIC ACID (Dexon)

This is a braided synthetic homopolymer of glycolic acid .It is supplied as an uncoated or coated form.[36] Since this suture is not a naturally occurring organic substance, so it is observed that there is less tissue reaction than surgical gut. It is absorbed by hydrolysis. After 2 weeks of implantation, 65% of the initial strength remains in contrast to 0% in case of surgical gut suture.[35-36]

POLYGLACTIN 910(Vicryl)

This is a braided, multifilament, coated, absorbable synthetic sutures. Degrades by hydrolysis. Absorption starts at day 40 approximately and is nearly completed by day 70. At 90 days it is completely dissolved.

SILK

It is derived from silkworm species Bombyx mori of the family Bombycidae, the larva of which produces silk to weave its cocoon. It is braided, coated suture. Silk is naturally occurring organic substance and induces a striking host inflammatory response. It has very low tensile strength and high risk of infections.[38-39]

NYLON

Due to its property of elasticity, it is useful for surface (epidermal, superficial) closure. Has a high memory and the suture loses its strength by 15-20% every year by hydrolysis.[37-38]

POLYPROPYLENE(PROLENE)

It has higher tensile strength than nylon and can easily pass through tissues and induces minimal tissue response. It has a high memory but proclivity for knot slippage is known. It has a good plasticity and it expands with tissue swelling to accommodate the wound.

MATERIAL AND METHODS

This prospective study was conducted in Dayanand Medical College and Hospital, Ludhiana on patients admitted for small intestine surgeries from 1st Dec 2019 to 31st May 2021 and after that 1 month follow up upto 30th June 2021**.**

The present study was carried out with following two groups of patients

1. Patients undergoing stapler anastomosis
2. Patients undergoing handsewn anastomosis

Study Design – a hospital based prospective study

INCLUSION CRITERIA –

All patients undergoing handsewn or stapler anastomosis of small intestine

EXCLUSION CRITERIA-

- Ulcers due to inflammation of small intestine, regional ileitis, regional enteritis, Crohn's disease, Ulcerative colitis
- Patients not willing to give consent for participation in this study.

METHODS OF COLLECTION

Patients coming in Department of Surgery, Dayanand Medical College and Hospital for small intestine surgeries from 1st Dec 2019 to 31st May 2021 and after that 1 month follow up upto 30th June 2021.

In the Stapler anastomosis group, the midline abdominal incision was given and abdomen was opened in layers. Underlying pathology identified and plan for resection of bowel done accordingly. After resection, two cut ends of the bowel (either open or stapled closed) were placed side to side (functional end to end anastomosis). If the bowel ends are closed, an enteroenterotomy must be made in each loop of bowel to allow stapler insertion. A cutting linear (GIA) stapler is then used to fuse the two bowel walls into a single septum with two double staggered rows of staples and to create lumen between the two bowel segments by dividing this septum between the rows. A noncutting linear (TA) stapler is then used to close the defect at the apex of the anastomosis where the GIA stapler was

inserted. An alternative, and cheaper method of closing the defect is to use a continuous suture. The cut and stapled edges of the bowel should be inspected for the adequacy of hemostasis before the apex is closed. True anatomic end- to- end stapled anastomosis may be fashioned with a linear stapler by triangulating the two cut ends and then firing the stapler three times in intersecting vectors to achieve complete closure.

In the handsewn anastomosis, the transected intestinal ends are milked to remove the luminal contents. The luminal disparity can be corrected by increasing the angle of the cut in the narrower segment of intestines so that the antimesenteric border of the intestine is shorter than the mesenteric border.

Place stay sutures at the mesenteric and antimesenteric borders to ensure that the remaining sutures are properly spaced and to facilitate intestinal manipulation. Start a simple continuous suture pattern at the mesenteric border, leaving the suture end long. Take bites about 3 mm wide and 3 mm apart, depending on the size of the intestines. If mucosa begins to evert then use a modified Gambee suture pattern: Pass the needle full thickness through the intestinal wall and then back through the mucosa on the near side. Then insert the needle at the mucosa-submucosa border on the far side to push the mucosa into the lumen, and pass the needle full thickness back out that side. Continue the pattern to the antimesenteric surface, and tie it in a knot to prevent a purse-string effect. Flip over the intestines to expose the opposite surface, and continue suturing back to the initial mesenteric suture and tie. Then close the mesentery to avoid damaging intestinal blood vessels. Then close the abdomen after confirming hemostasis and peritoneal lavage if needed.

The factors assessed postoperatively were like SSI, anastomotic leaks, return of bowel sounds, resumption of oral feeds, hospital stay, return to work.

OUTCOME

Our study evaluated the various factors influencing the outcome or postoperative recovery after anastomosis and assessing the clinical outcome after two different techniques of bowel anastomosis and morbidity associated with each.

STATISTICAL ANALYSIS

Data was described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups was done using Student t-test. For comparing categorical data, Chi square ($\chi 2$) test was performed and exact test was used when the expected frequency is less than 5. A probability value (pvalue) less than 0.05 was considered statistically significant. All statistical calculations were done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

INVESTIGATIONS OR INTERVENTIONS CONDUCTED ON PATIENTS

Patients included in the study underwent hematological, biochemical and radiological investigations. Patients included in the study were informed regarding their inclusion and written informed consent was taken for all the patients included in the study.

Hematological and Biochemical Investigations –

1. Hemogram
2. Serum electrolytes
3. Serum urea and creatinine
4. Serum albumin

Radiological Investigations –

1. Chest xray 2.Ct enterography

OBSERVATIONS AND RESULTS

A hospital based prospective study was conducted to study the outcomes of using stapler and sutures during small bowel anastomosis and to compare outcomes on the basis of anastomotic leak, return of bowel sounds, operating time, resumption of feeds, SSI, return to work. The following study was carried out with 34 patients in stapled anastomosis group and 27 in hand sewn anastomosis groups.

Distribution of patients according to Age

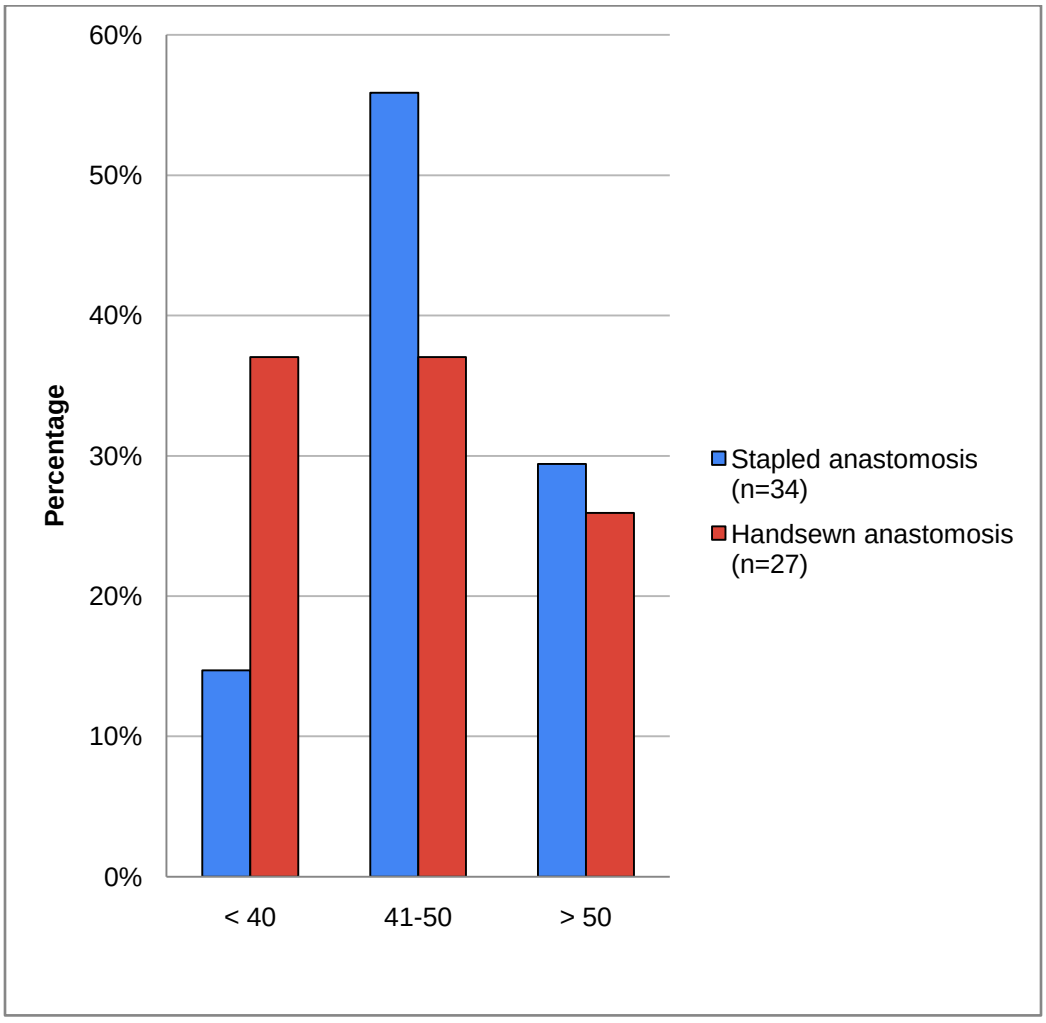
Majority of patients in stapler anastomosis group were in 41-50 years age group (56%), followed by >50 yrs age group (29%), followed by <40 yrs age group (15%).

Majority of patients in handsewn anastomosis group were in <50% age group (76%), followed by >50 yrs age group (26%). There was no significant difference between the groups as per Student t-test (p>0.05).

Table 1: Distribution of patients according to Age

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
AGE GROUP	< 40	5	15%	10	37%	15	4.242	0.120
	41-50	19	56%	10	37%	29		
	> 50	10	29%	7	26%	17		

Figure 1: Distribution of patients according to Age



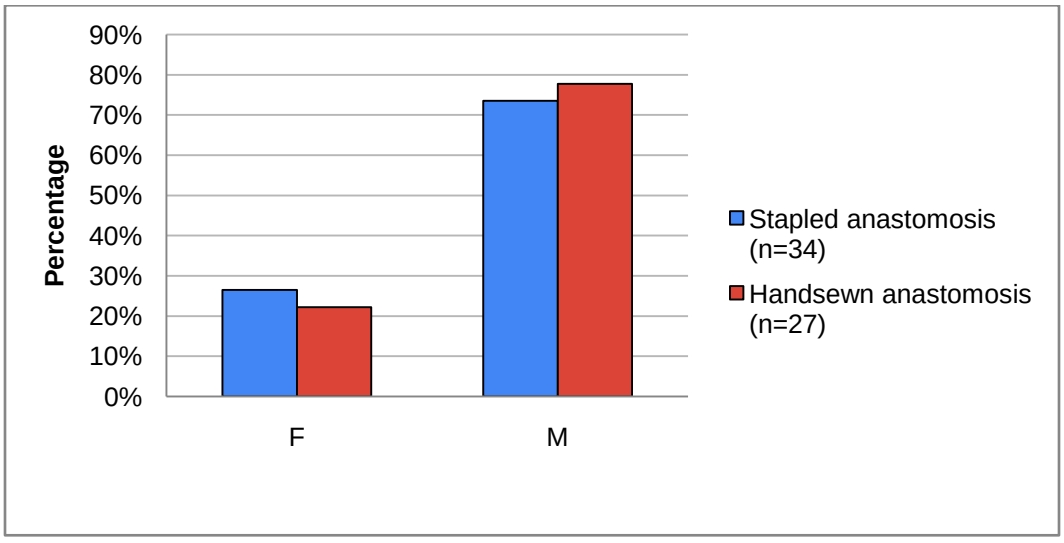
Distribution of patients according to Gender

There was male preponderance in both the groups (74% and 78% Respectively) while there were 26% and 22% female patients in stapler anastomosis and handsewn anastomosis group respectively.

Table 2: Distribution of patients according to gender

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		Stapled anastomosis (n=34)	Stapled anastomosis (n=34)	Handsewn anastomosis (n=27)	Handsewn anastomosis (n=27)			
Sex	F	9	26%	6	22%	15	0.146	0.702
	M	25	74%	21	78%	46		

Figure 2: Distribution of patients according to gender



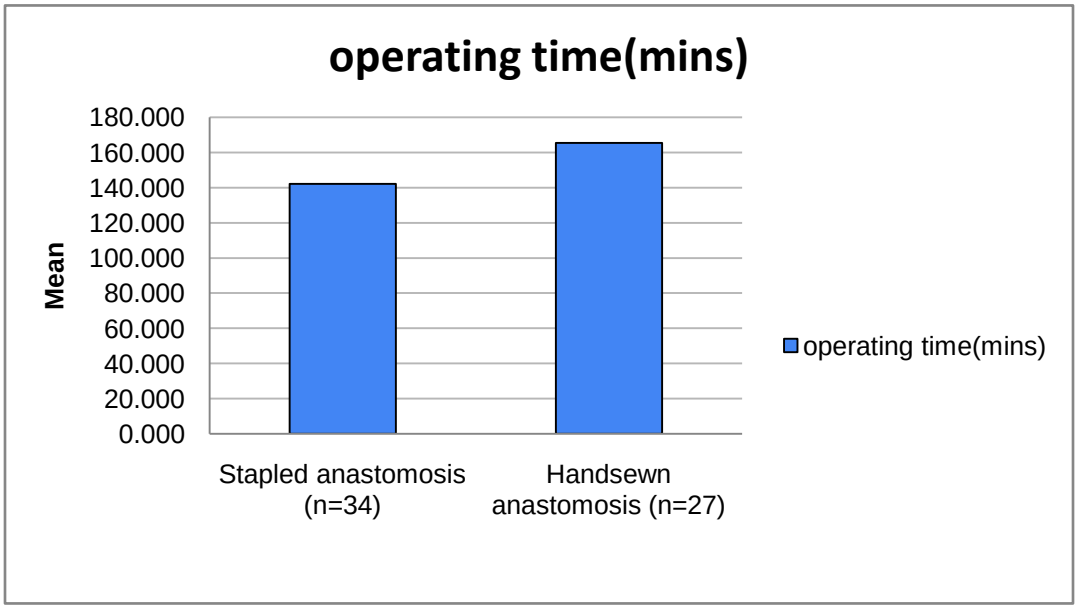
Distribution of patients according to operative time

1. The mean operative time in stapler anastomosis and handsewn anastomosis groups was 142.20 minutes and 165.37 minutes respectively. There was a significant difference between the groups as per Student t-test ($p<0.05$).

Table 3: Distribution of patients according to operative time

	Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		t	p-value
	Mean	SD	Mean	SD		
operating time(mins)	142.206	11.428	165.370	15.123	-6.816	0.001

Figure 3: Distribution of patients according to operative time



Distribution of patients according to Hospital Stay

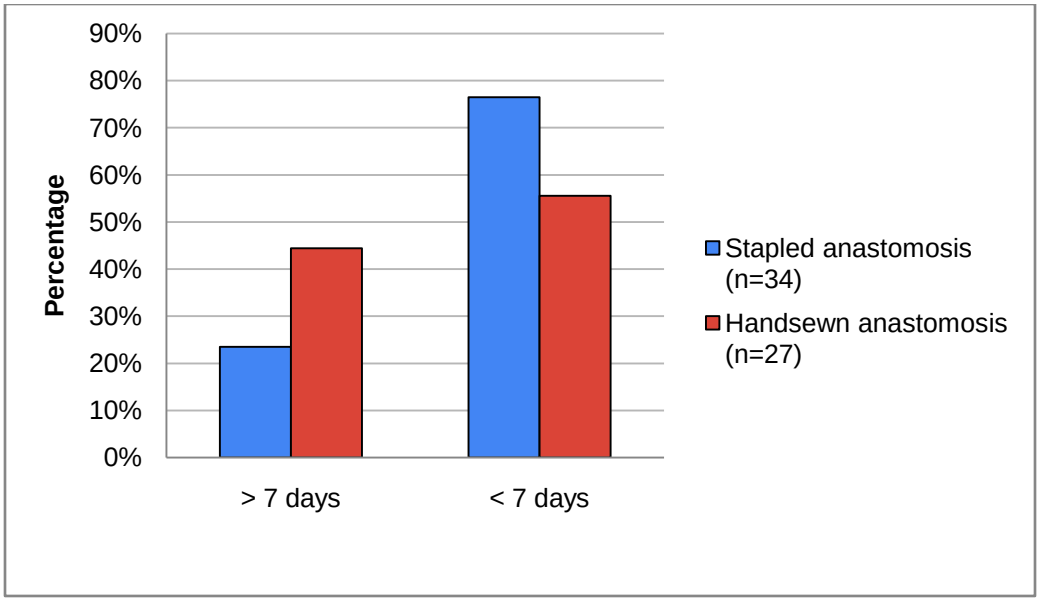
The duration of Hospital Stay of less than 7 in stapler anastomosis group and handsewn anastomosis group was noted in 76% and 56% respectively.

There was no significant difference between the groups as per Student t-test (p>0.05).

Table 4: Distribution of patients according to hospital stay

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
hospital stay	> 7 days	8	24%	12	44%	20	0.299	0.084
	< 7 days	26	76%	15	56%	41		

Figure 4: Distribution of patients according to hospital stay



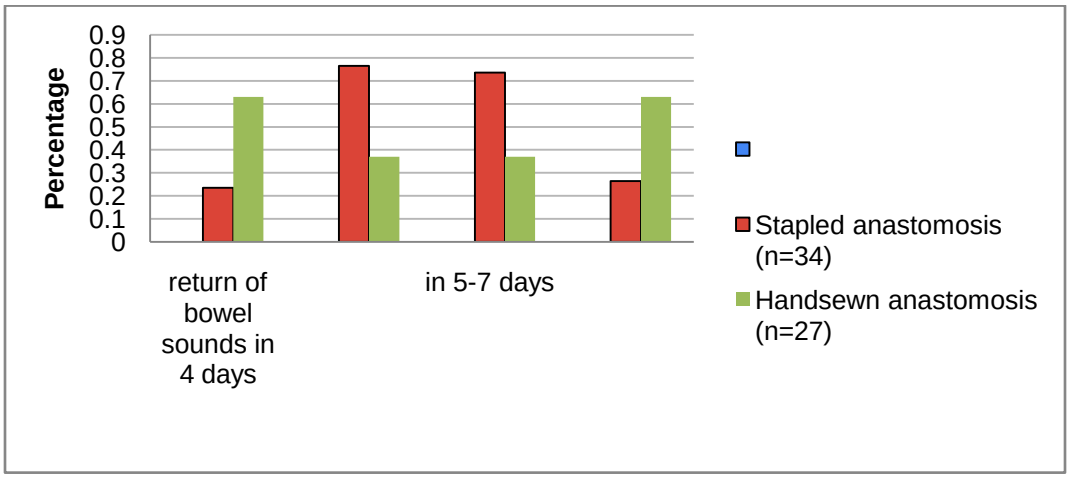
Distribution of patients according to return of bowel sounds in stapled anastomosis and handsewn anastomosis group

The return of bowel sounds within 4 days in stapler and handsewn anastomosis group was 76% (26 out of 34) and 37% (10 out of 27) respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Table 5: Distribution of patients according to return of bowel sounds in stapled anastomosis and handsewn anastomosis group

return of bowel sounds in 4 days in 5-7 days	N	8	24%	17	63%	25	9.675	0.002
	Y	26	76%	10	37%	36		
	N	25	74%	10	37%	35	8.195	0.004
	Y	9	26%	17	63%	26		

Figure 5: Distribution of patients according to return of bowel sounds in stapled anastomosis and handsewn anastomosis group



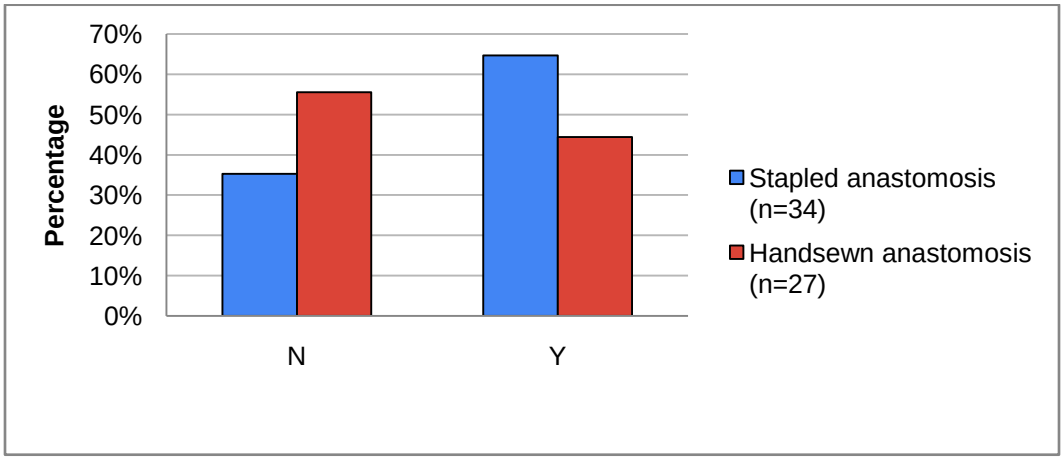
Distribution of patients according to resumption of postoperative feeding within 72 hours in stapled anastomosis and handsewn anastomosis group

The resumption of postoperative feeding within 72 hours in stapled anastomosis and handsewn anastomosis group was 65% (22 out of 34) and 44%(12 out of 27) respectively. There was no significant difference between the groups as per Student t-test ($p<0.05$).

Table 6: Distribution of patients according to resumption of postoperative feeding within 72 hours in stapled anastomosis and handsewn anastomosis group

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		Stapled anastomosis (n=34)	Stapled anastomosis (n=34)	Handsewn anastomosis (n=27)	Handsewn anastomosis (n=27)			
postop feed within 72 hrs	N	12	35%	15	56%	27	2.504	0.129
	Y	22	65%	12	44%	34		

Figure 6: Distribution of patients according to resumption of postoperative feeding within 72 hours in stapled anastomosis and handsewn anastomosis group



Distribution of patients according to complications (surgical site Infection, wound dehiscence, bile in drain, bilious discharge from operative site)

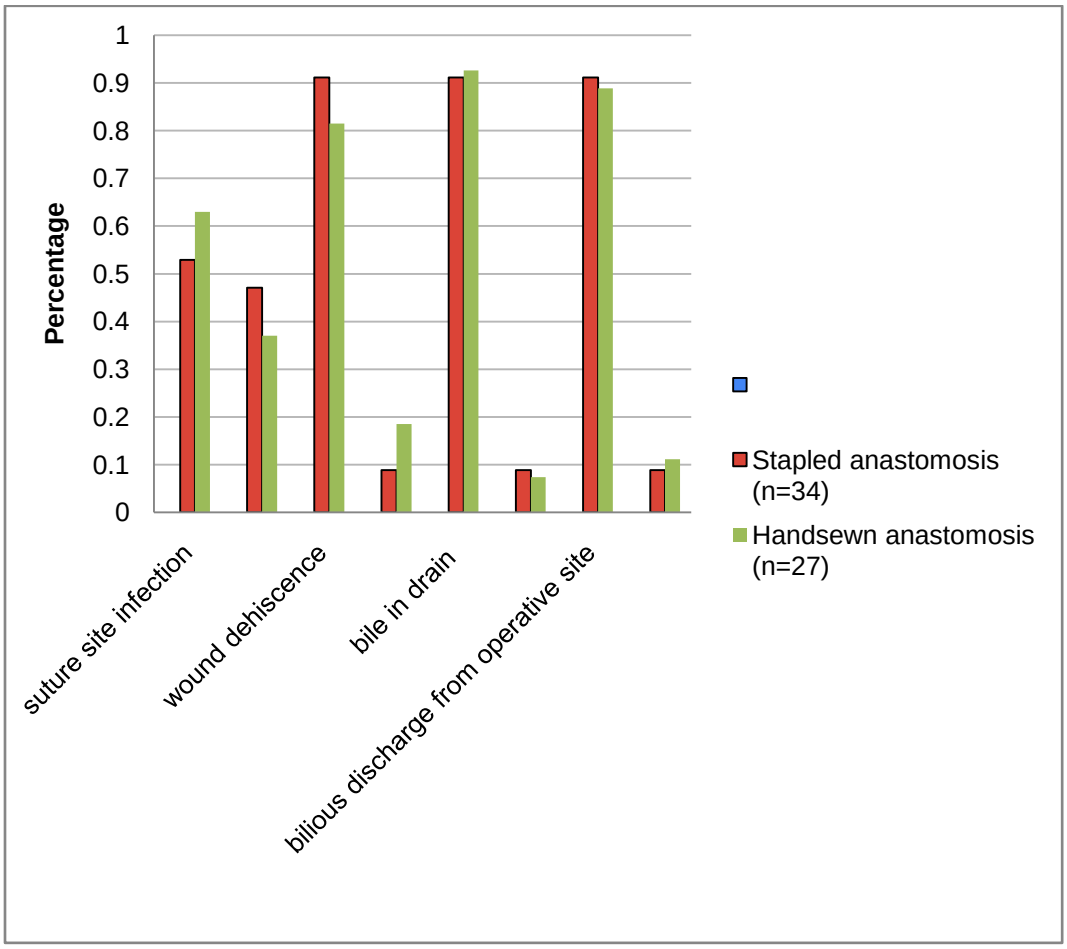
The complication of suture site infection postoperatively in stapled anastomosis and handsewn anastomosis group was 47% (16 out of 34) and 37%(10 out of 27) respectively. There was no significant difference between the groups as per Student t-test ($p<0.05$).

The incidence of wound dehiscence, bile in drain and bilious discharge from operative sites was insignificant as per student t-test.

Table7: Distribution of patients according to complications (surgical site Infection,wound dehiscence, bile in drain, bilious discharge from operative site)

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		Stapled anastomosis (n=34)	Stapled anastomosis (n=34)	Handsewn anastomosis (n=27)	Handsewn anastomosis (n=27)			
suture site infection	N	18	53%	17	63%	35	0.618	0.432
	Y	16	47%	10	37%	26		
wound dehiscence	N	31	91%	22	81%	53	1.241	0.265
	Y	3	9%	5	19%	8		
bile in drain	N	31	91%	25	93%	56	0.040	0.841
	Y	3	9%	2	7%	5		
bilious discharge from operative site	N	31	91%	24	89%	55	0.089	0.766
	Y	3	9%	3	11%	6		

Figure 7: Distribution of patients according to complications (surgical site Infection, wound dehiscence, bile in drain, bilious discharge from operative site)



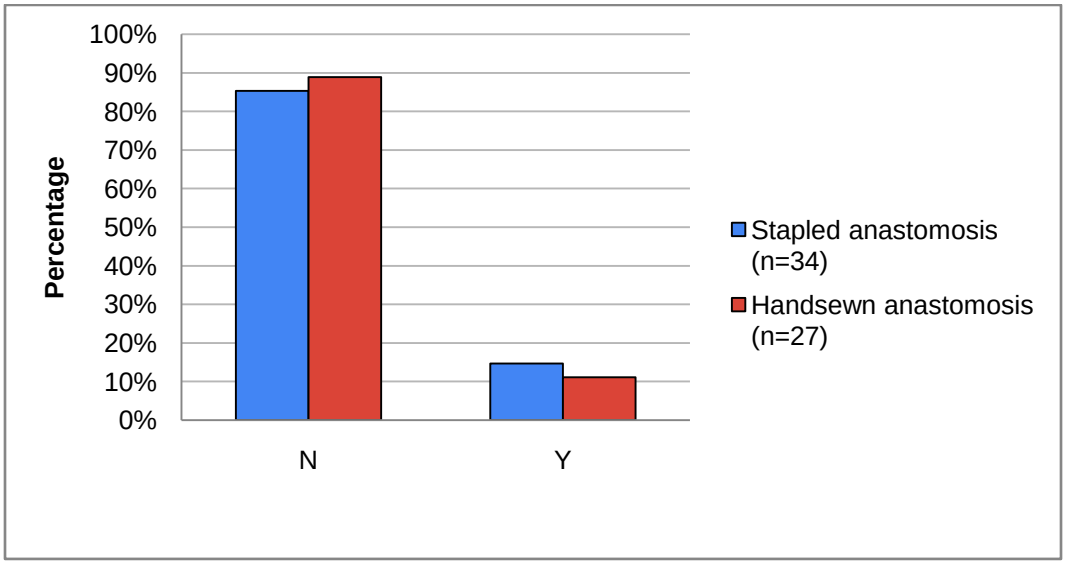
Distribution of patients according to anastomotic leak in stapled anastomosis and handsewn anastomosis group

The complication of anastomotic leak in stapled anastomosis and hand sewn anastomosis group was 15% (5 out of 34) and 11% (3 out of 27) respectively. There was no significant difference between the groups as per Student t-test ($p<0.05$).

Table 8: Distribution of patients according to anastomotic leak in stapled anastomosis and handsewn anastomosis group

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		Stapled anastomosis (n=34)	Stapled anastomosis (n=34)	Handsewn anastomosis (n=27)	Handsewn anastomosis (n=27)			
Anastomotic Leak	N	29	85%	24	89%	53	0.171	0.680
	Y	5	15%	3	11%	8		
Total		34	100%	27	100%	61		

Figure 8: Distribution of patients according to anastomotic leak in stapled anastomosis and handsewn anastomosis group



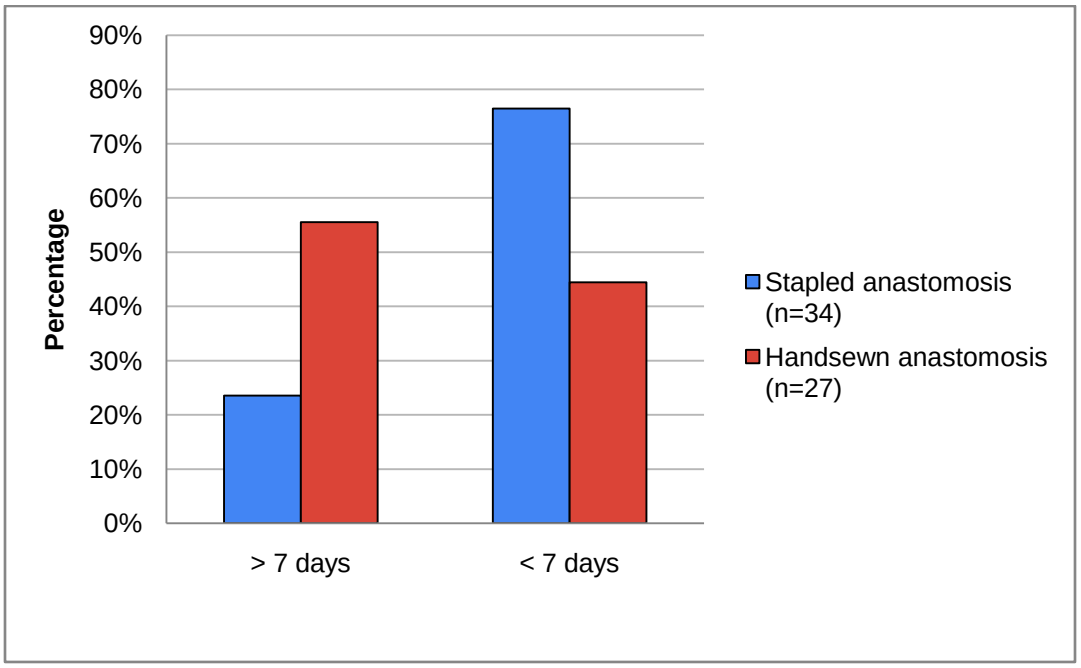
Distribution of patients according to return to work within 7 days after discharge in stapled anastomosis and handsewn anastomosis group

The return to work within 7 days after discharge in stapled anastomosis and handsewn anastomosis group was 76% (26 out of 34) and 44%(12 out of 27) respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

Table 9: Distribution of patients according to return to work within 7 days after discharge in stapled anastomosis and handsewn anastomosis group

		Stapled anastomosis (n=34)		Handsewn anastomosis (n=27)		Total	Chi-square value	p-value
		Stapled anastomosis (n=34)	Stapled anastomosis (n=34)	Handsewn anastomosis (n=27)	Handsewn anastomosis (n=27)			
return to work(after discharge)	> 7 days	8	24%	15	56%	23	6.572	0.010
	< 7 days	26	76%	12	44%	28		

Figure 9: Distribution of patients according to return to work within 7 days after discharge in stapled anastomosis and handsewn anastomosis group



DISCUSSION

This hospital based prospective study was conducted at our tertiary care centre to compare the outcome of handsewn vs stapler anastomosis.

The present study was carried out with following two groups of patients –

1. Patients undergoing handsewn anastomosis (27 patients)
2. Patients undergoing stapler anastomosis (34 patients)

During exploratory laparotomies, the most common dilemma is about the choice of anastomosis to be performed for a quick postoperative recovery and to minimize complications postoperatively.

The most common and frightening complication is the' ANASTOMOTIC FAILURE'. With the recent advancements and improvisation in suturing techniques along with advancing and better staplers, this complication has significantly declined.

Handsewn anastomosis and Stapler anastomosis are used for anastomosis, but there is no consensus on the ideal anastomotic technique despite continuing study. There are many studies stating stapler anastomosis better than hand sewn in terms of early postoperative recovery, decreased operative time but the overall risk of anastomotic leak is more or less the same in both the groups.

Overall, Failure rates range from 1-24% which depends on technique used for anastomosis (handsewn vs stapler), also the setting in which the surgery was performed i.e. emergency or elective surgery.

Leak rate depends on factors like location and systemic factors, example- sepsis, anemia which results in poor perfusion therefore poor healing, DM, previous irradiation or chemotherapy, malnutrition causing hypoalbuminemia, vitamin deficiencies, steroid use causing immunosuppression, and certain conditions like IBD, Crohn's disease are factors are associated with poor anastomotic healing and increased anastomotic leak rates.

In this prospective nonrandomized trial, the anastomotic leak was 15% (5 out of 34) in stapler anastomosis group and 11% (3 out of 24) in handsewn anastomosis group. There was no significant difference between the groups as per Student t-test ($p<0.05$). This is comparable to studies of Brandon Robert Bruns et al[41], David N. Naumann[42] and Abdul Qayoom Khan et al.[43]

Brandon Robert Bruns et al study stated that there was no significant difference in operative time and anastomotic failure in both the groups who underwent handsewn and stapler anastomosis (of 649 anastomoses – mean age was 61 years, 51% were men, 7% overall mortality and 12.5% overall anastomotic failure rate).

David N. Naumann et al study stated that there was no significant difference in seen in anastomotic failure rates in either group. There was no demonstrable difference in duration of hospital stay, mortality between these groups, abscess, and fistula. 15% failure rate in stapled anastomosis group and 11.7% failure rate in handsewn anastomosis group. For the studies that reported anstomotic leak, there was no difference at an anastomosis level between stapled (20/540; 3.7%) and handsewn (21/432; 4.9%)

Abdul Qayoom et al reported that in his study, that 4 out of 30 (13.3%) patients in the control group (handsewn) developed clinical evidence of a leak, as compared to 3 out of 30 (10.0%) patients in the study group (stapled). The difference was statistically insignificant with a p-value of 0.688. Resumption of oral feeding started earlier in patients undergoing stapled anastomosis (4.0 ± 1.01 days) as compared to handsewn anastomosis (5 ± 0.83). This difference was found to be significant with a p-value of 0.001.Mean hospital stay of 8.1 ± 2.12 days in handsewn anastomosis group and 7.8 ± 1.76 days in stapled anastomosis group. The difference was found to be statistically insignificant with a p-value of 0.554.

In our study, there was a significant difference in the mean operating time between HS and SA groups. The mean operating time along with the HS and SA was 142.2 ± 11.4 mins and 165.3 ± 15.12 mins respectively. There was significant difference between the groups as per Student t-test ($p<0.05$).

As per Shubhakar Bhandary et al study, the mean total operating time for HS group was 269.14 mins whereas for the stapler group it was 253.43 mins with a p-value of 0.500 which was statistically not significant. The mean operating time was significantly shorter in stapler group.

In Banurekha R et al study, the mean duration of time in resection and anastomosis group was 3 hours in HS but in case of stapler it was 2.25hours with p-value of 0.04 which was significant.

The return of bowel sounds (within 4 days) and resumption of oral feeding in SA and HS groups was 76% and 37% respectively. There was a significant difference between the groups as per Student t-test ($p>0.05$) in the return of bowel sounds but no significant difference in resumption of oral feeding which was 65% in SA group and 44% in HS anastomosis group.

In Shubhakar Bhandary et al study, the return of bowel sounds , was 3.89 in the HS group and 3.26 in the SA group with a p-value of 0.117, which was statistically not significant. Similar findings were noted in Himabindu Bandgaru et at[45] and Damesha et al.[46]

In the Banurekha R et al study, The mean time to take oral feeding was 4 days in handsewn group and was 2.5 days in stapler group with p-value of 0.014 which concurred with Damesha[46] study detected no differences in their study whereas Scher[47] study showed there is no significant difference between both groups which was 3.7 days in handsewn and 3.8 days in stapler anastomosis.

The suture site infection in SA and HS anastomosis was 47% and 37% respectively with a p-value of 0.432 which is not significant according to student t-test. So, there was no significant difference in SSI.

This was similar to the finding by Abdul Qayoom Khan et al study, where SSI in HS group was 10% and in SA group was 6.7%. This difference was found to be statistically insignificant (p-value =0.64).

The duration of hospital stay in HS and SA group was <7days in 56% and 76% respectively with a p-value of 0.084. So as per student t-test, the difference was insignificant. This finding was similar to Abdul Qayoom Khan et al study, Damesha study, Scher study.

The return to work after discharge was found to be earlier in SA group than HS group which was about 76% within 1 week of discharge and 44% within first week of discharge respectively. The p-value was 0.010 which shows a significant difference as per student t-test.

As per Scher, Reiling[48] and Banurekha R study also the mean duration of return to work was significantly earlier in SA group.

So, according to our study, we conclude that there was a statistically significant difference in mean operating time, return of bowel sounds and return to work after discharge in SA and HS groups where SA group was considered better in the following mentioned aspects. While in a few studies duration of hospital stay and resumption of oral feeding were also significantly favourable in stapler anastomosis group. Overall there is no significant difference in anastomotic leak and suture site infection between both the groups.

Therefore stapler anastomosis is a quicker technique and makes resumption of oral feeding earlier due to earlier resumption of bowel sounds. With the modern advances in staplers, a surgeon should be adept with the stapling technique as well as suturing.

Due to decreased operative time in stapling technique, staplers may be a boon in cases where the patient is physiologically vulnerable and cannot tolerate anesthesia for a long duration.

SUMMARY AND CONCLUSION

This prospective study was conducted in the department of General Surgery at Dayanand Medical College and Hospital, Ludhiana after approval by Institutional Ethics Committee on a total of 61 patients to assess the clinical outcome of anastomosis after two separate techniques of anastomosis that is handsewn and stapler anastomosis.

The present study was carried out with following two groups of patients-

1. Patients undergoing handsewn anastomosis (27 patients)
2. Patients undergoing stapler anastomosis (34 patients)

The following observations were noted –

1. Majority of the patient were in stapled anastomosis group were in 41-50 yrs age group (56%), followed by >50 yrs age group (29%), followed by <40 yrs age group (15%).
2. Majority of the patients in handsewn anastomosis group were <50 yrs of age (74%), followed by 26% in >50 yrs age group.
3. There was male preponderance in both the groups (74% and 78%) in stapled and handsewn groups respectively. While female in SA were 26% and in HS group were 22%.
4. The mean operating time in SA and HS groups were 142.20 minutes and 165.37 minutes respectively. There was a significant difference between the groups as per Student t-test ($p<0.05$).
5. The risk of anastomotic leak in SA group and HS group were 15% (5 out of 34) and 11% (3 out of 27) respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).
6. The return of bowel sounds within 4 days in SA group and HS group were 76% (26 out of 34) and 37% (10 out of 27) respectively. There was a significant difference between the groups as per Student t-test ($p<0.05$).
7. The incidence of postoperative suture site infection in SA group and HS group were 47% (16 out of 34) and 37% (10 out of 27)

respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).

8. The resumption of oral feed within 72 hours in SA group and HS group was 65% (22 out of 34) and 44% (12 out of 27) respectively. There was no significant difference between the groups as per Student t-test ($p>0.05$).
9. The duration of hospital stay of less than 7 days in SA group and HS group was noted in 76% (26 out of 34) and 56% (15 out of 27). There was no significant difference between the groups as per Student t-test ($p>0.05$).
10. The return to work after discharge within 7 days in SA group and HS group was noted in 76% (26 out of 34) and 44% (12 out of 27). There was a significant difference between the groups as per Student t-test ($p<0.05$).

Hence, we conclude that if staplers are used for small bowel anastomosis technique then there is decreased mean operating time, earlier return of bowel sounds which results in earlier resumption of feed, decreased duration of hospital stay and earlier return to work. Though there is no difference in anastomotic leak incidence. Thus, the use of staplers may be considered as a better option for anastomosis.

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PROFORMA

Sr. No. ___

Name Age Sex

MRD No. Date of Admission Date of Discharge

Chief Complaints:

Pain abdomen- Y / N

Vomiting- Y / N

Fever- Y / N

Constipation- Y / N

Abdominal distension- Y / N

Past History: Comorbidities

Diabetes- Y / N

CKD- Y / N

CLD- Y / N

CAD- Y / N

TB- Y / N

Malignancy- Y / N

HTN- Y / N

Chemotherapy- Y / N

Radiotherapy- Y / N

COPD- Y / N

Surgical History:

Any previous laparotomy – Y / N

Any h/o anastomotic leak - Y / N

Personal History:

Smoker- Y / N

Alcoholic- Y / N

Obese- Y / N

Coagulopathy- Y / N

Malnourished - Y / N

EXAMINATION-Per abdomen-

Tenderness- Y / N

Distension- Y / N

Gaurding- Y / N

Rigidity- Y / N

Palpable mass- Y/ N

INDICATION for surgery-

Perforation – Y / N

Stoma closure- Y / N

Obstruction - Y / N

Enterocutaneous fistula –Y / N

Malignancy- Y/N

TYPE OF SURGERY-

Elective / Emergency

INVESTIGATIONS-

Albumin-

TLC-

Hb-

Platelet-

INR-

Urea-

Creatinine-

OT FINDINGS-

Type of anastomosis:

Hand Sewn- Y / N

Stapled- Y / N

Site of anastomosis:

Jejunum- Y / N

Ileum- Y / N

Post op-

Time of Return of Bowel Sounds:

Within 4 days- Y / N

5 -7 days - Y / N

Post op Feeding :

Within 72 hrs- Y / N

After 72hrs - Y / N

After 120 hrs- Y / N

Enteral feed- Y / N

Parenteral feed- Y / N

Wound complications:

Suture site infection- Y / N

Wound dehiscence- Y / N

Anastomotic leak:

Bile in drain- Y / N

Bilious discharge from operative site – Y / N

Pain abdomen - Y/ N

Fever post op - Y / N

Peritonism - Y / N

Tachycardia - Y / N

Prolonged ileus - Y / N

Enterocutaneous fistula- Y / N

Re-exploration: Y / N

In 1 week- Y / N

Between 1-6 weeks- Y / N

After 6 weeks- Y/N

Duration of hospital stay:

< 7 days – Y / N

> 7 days – Y / N

Anastomotic Leak- Y / N

Time for Anastomosis (mins)-

Operating Time (mins)-

Return to work <7 days after discharge- Y / N

> 7 days – Y / N

Signature of Candidate **Signature of Supervisor**

S.no.	Name	Age	Sex	Mrd no.	DOA	DOD	Pain abdomen	Vomiting	Fever	Constipation	Abdominal distension	diabetes	CKD	CLD	CAD	TB	Malignancy	HTN	COPD	Previous laparotomy	h/o anastomotic leak	smoker	alcoholic	obese	coagulopathy	malnourished	tenderness	distension	guarding	rigidity	palpable mass	perforation	stoma closure	obstruction	ec fistula	malignancy	elective
1	JK	19	F	854540	22/11/19	31/12/19	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N	Y	N	N	N
2	SK	62	F	870080	20/12/19	30/12/19	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	N	Y	N	N	Y	N	N	N
3	ND	27	F	870125	21/12/19	28/12/19	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	N	N	N	Y	N	N	N
4	BS	42	M	824586	01-07-2020	15/1/20	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N	Y
5	S	25	F	838747	01-02-2020	01-08-2020	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
6	GS	65	M	841099	01-01-2020	15/1/20	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
7	PK	65	F	878915	01-09-2020	24/1/20	Y	Y	N	Y	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	Y	N	Y	Y
8	H	58	M	883495	29/1/20	20/2/20	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	Y	Y	N	N	N	N	N	Y	N	N	Y
9	K	27	M	862970	02-03-2020	02-12-2020	N	N	Y	Y	Y	Y	Y	N	N	N	N	Y	N	Y	Y	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	Y	N	Y
10	BS	52	M	892726	02-04-2020	22/2/20	N	N	N	N	Y	N	N	Y	N	N	N	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N	Y
11	GS	53	M	894094	02-06-2020	17/3/20	Y	Y	N	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Y	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N
12	HS	60	M	915040	03-12-2020	20/3/20	Y	Y	N	N	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	N	Y	N	N	N	N	N
13	DS	57	M	944521	17/7/20	08-01-2020	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	Y	Y	N	N	N	N	Y	N	N	N
14	KD	65	M	934653	14/6/20	25/6/20	N	Y	N	Y	Y	N	N	N	N	N	N	N	Y	N	N	Y	Y	N	N	N	N	Y	N	N	N	N	N	Y	N	N	Y
15	JS	78	M	933413	06-09-2020	20/6/20	Y	Y	Y	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	Y	N	N	Y
16	GS	29	M	811498	16/6/20	24/6/20	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	Y
17	DK	61	M	69737	22/6/20	30/6/20	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	Y
18	MS	38	M	752965	06-08-2020	15/6/20	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	Y	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	Y	Y
19	BS	45	M	697454	03-10-2020	24/3/20	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	N	N	N
20	B	26	M	910312	30/5/20	06-08-2020	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N
21	BS	29	M	912785	03-12-2020	24/3/20	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	Y
22	AS	45	M	922484	16/4/20	23/4/20	Y	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	Y	N	N	Y
23	MS	78	M	666113	18/5/20	06-02-2020	N	N	Y	N	Y	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	Y	N	Y	Y	Y	N	N	N	N	Y	N	N	N
24	SS	75	M	874143	18/3/20	24/3/20	N	N	N	N	N	Y	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
25	BS	55	M	880977	13/3/20	19/3/20	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
26	KS	55	M	916188	14/3/20	23/3/20	Y	Y	N	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	N	Y	N	N	Y	N	N
27	SK	60	F	921572	04-08-2020	27/4/20	Y	Y	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	Y	N	N	N	N	N	Y	N	N	Y
28	DS	59	M	462811	26/4/20	15/5/20	Y	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N	N	N	N	N	Y	N	N	Y
29	SS	69	M	924348	15/5/20	29/5/20	Y	Y	N	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	Y	Y	Y	N	N	N	N	N	Y	N	N	N
30	MS	51	M	929890	29/5/20	06-10-2020	Y	Y	N	Y	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	Y
31	VK	30	M	919947	06-03-2020	06-11-2020	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
32	MS	88	M	837113	13/7/20	23/7/20	Y	N	N	Y	Y	Y	Y	N	Y	N	N	Y	N	Y	N	N	Y	N	N	N	Y	Y	Y	N	N	N	N	Y	N	N	N
33	RK	45	M	940313	07-05-2020	07-10-2020	Y	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N
34	HK	30	F	856065	20/7/20	29/7/20	Y	Y	Y	Y	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	N	Y	N	N	N	N	N
35	PK	37	F	918082	07-09-2020	17/7/20	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
36	PK	46	M	422974	07-01-2020	14/7/20	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	Y	N	N	N
37	DS	57	M	944521	17/7/20	08-01-2020	Y	Y	N	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	Y	Y	N	N	N	N	Y	N	N	Y
38	AS	68	M	944661	08-10-2020	18/8/20	Y	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N	N	N	N	N	Y	Y	N	Y
39	SS	16	M	936339	18/8/20	26/8/20	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	Y
40	GS	23	M	987681	16/11/20	28/11/20	Y	Y	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	N	Y	N	N	N	N	N
41	SR	42	M	801909	19/10/19	13/11/19	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
42	RK	27	F	804588	13/11/20	22/11/20	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	Y
43	PA	51	F	800369	13/11/19	21/11/19	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	Y
44	RR	60	M	842736	11-04-2019	16/11/19	N	N	N	N	N	Y	Y	N	Y	N	N	Y	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	Y
45	BS	45	M	810584	12-01-2019	12-07-2019	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
46	MS	70	M	877375	23/11/20	12-02-2020	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
47	KS	68	M	983021	28/11/20	12-Feb	Y	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	N	Y	N	N	N	N	N
48	SS	48	M	920911	01-04-2021	01-12-2021	N	N	N	N	N	Y	N	N	N	N	Y	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	Y
49	SR	65	M	159724	19/3/21	30/3/21	N	N	Y	N	N	Y	N	N	Y	N	N	Y	Y	Y	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	Y

emergency	albumin	TLC	Hb	Platelet	INR	Urea	Creatinine	Handsewn anastomosis	Stapled anastomosis	jejunal site	ileal site	return of bowel sounds in 4 days	in 5-7 days	postop feed within 72 hrs	feed >72hrs	enteral feed	parenteral feed	suture site infection	wound dehiscence	bile in drain	bilious discharge from operative site	post op pain abdomen	post op fever	post op peritonism	post op tachycardia	post op prolonged ileus	post op ec fistula	Re-Exploration	re-exploration in 7 days	in 1-6 weeks	after 6 weeks	hospital stay for < 7 days	>7 days	Anastomotic Leak	time for anastomosis(mins)	operating time(mins)	return to work(< 7 days after	>7 after discharge
Y	2.67	9	8	170	1.12	30	0.7	N	Y	N	Y	Y	N	Y	N	Y	Y	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	Y	N	Y	9	130	Y	N
Y	3.18	9.6	11.8	421	1.3	49	1.44	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	Y	N	N	N	N	N	N	Y	N	10	150	Y	N
Y	2.87	8.1	8.5	183	1.42	8	0.32	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	11	145	N	Y
N	3.84	5.3	11	163	0.96	24	0.6	Y	N	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	30	180	N	Y
N	3.02	11.3	10	153	1.13	6	0.39	Y	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	25	175	N	Y
N	3.97	9.8	11.2	230	1.08	60	1.09	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	10	135	Y	N
N	3.54	5.9	9.6	185	1.34	37	0.6	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	N	Y	N	N	Y	Y	N	Y	30	180	N	Y
N	2.7	9	9.3	170	1.3	60	1	N	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	N	Y	10	140	Y	N
N	4.09	6.2	11.8	270	0.96	187	3.5	Y	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	10	150	Y	N
N	4	7.6	11.1	150	1.4	9	0.67	N	Y	Y	N	Y	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	Y	N	Y	Y	N	N	Y	Y	N	Y	7	135	Y	N
Y	2.71	9.1	11	280	1.3	19	1	N	Y	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	N	Y	Y	8	140	Y	N
Y	4.54	11.2	7.8	184	1.6	127	3.8	N	Y	N	Y	N	Y	Y	N	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	9	120	N	Y
Y	4.2	7.5	8.1	150	1.79	112	1.87	N	Y	N	Y	Y	N	Y	N	Y	Y	Y	N	N	N	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	10	130	Y	N
N	4.4	3.2	9.3	162	1.3	26	0.85	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	Y	N	N	Y	N	N	N	N	N	N	Y	N	N	10	125	N	Y
N	2.3	31.6	9.7	491	2.35	78	1.8	N	Y	N	Y	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	8	130	Y	N
N	4.66	7.3	8.2	177	0.9	24	0.86	Y	N	N	Y	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	25	190	N	Y
N	4.03	5.1	13.4	162	1.03	30	1.02	Y	N	N	Y	N	Y	N	Y	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	25	180	N	Y
N	4.64	5.4	13.2	170	1.13	16	0.57	Y	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	25	170	Y	N
Y	2.81	11.9	5.9	427	1.22	79	1.68	Y	N	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	N	N	N	N	N	Y	N	Y	10	130	Y	N
Y	3.05	7	14	150	1.12	8	0.54	Y	N	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	30	170	Y	N
N	3.41	8.8	10.8	267	1.19	32	0.57	N	Y	Y	N	Y	N	Y	N	Y	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	7	125	Y	N
N	3.65	6	8.9	353	1.2	11	0.77	N	Y	N	Y	Y	N	N	Y	Y	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	10	130	Y	N
Y	3.55	7.6	5.7	174	1.1	107	2.48	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	8	140	N	Y
N	4.4	7.7	11.4	202	1.3	17	0.86	Y	N	N	Y	N	Y	Y	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	Y	28	180	N	Y
N	4.34	7.1	13.7	228	1.01	29	0.64	Y	N	N	Y	Y	N	Y	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	25	160	Y	N
Y	2.54	11.1	8.2	485	1.76	39	0.81	Y	N	Y	N	N	Y	N	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	N	N	N	N	N	N	N	Y	N	27	170	Y	N
N	3.57	9.9	9.9	671	1.02	9	0.59	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	10	150	Y	N
N	3.68	7.8	12.7	166	1.4	23	0.94	N	Y	Y	N	Y	N	N	Y	Y	N	N	N	N	N	N	Y	N	Y	N	N	N	N	N	N	N	Y	N	10	150	N	Y
Y	2.89	10.9	9.6	331	1.24	120	1.72	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	N	N	N	N	Y	N	35	170	N	Y
N	4.1	7.8	10.4	270	1.3	42	0.78	N	Y	N	Y	Y	Y	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	30	160	Y	N
N	4.17	6.5	14.2	284	1.14	34	0.62	Y	N	N	Y	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	25	180	N	Y
Y	3.68	7.3	12.2	226	1.34	33	1.19	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	Y	N	30	170	Y	N
Y	4.14	6	14.8	140	1.79	63	1.03	N	Y	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	8	150	Y	N
Y	4.44	7.6	10.3	339	1.14	18	0.49	Y	N	N	Y	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	9	140	Y	N
N	3.47	9.1	11.9	197	0.99	14	0.49	Y	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	30	170	N	Y
Y	4.02	16.4	12.1	215	1.23	33	1.58	N	Y	Y	N	N	Y	N	Y	Y	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	10	140	Y	N
N	3.2	17.3	9.6	237	1.89	263	4.55	Y	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	10	150	Y	N
N	3.03	5.2	8.3	357	1.18	28	0.87	N	Y	N	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	8	140	Y	N
N	4.54	7.8	12.4	90	1.27	13	0.5	Y	N	N	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	25	180	N	Y
Y	2.38	13.5	9.8	967	1.74	32	0.47	N	Y	N	Y	N	Y	N	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	Y	Y	N	N	Y	N	Y	Y	10	160	N	Y
N	3.66	7.4	11.8	210	1.14	38	0.52	Y	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	30	150	N	Y
N	4.28	10	13	170	1.43	34	0.9	Y	N	N	Y	N	Y	N	Y	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	25	140	Y	N
N	4.19	9.4	13.4	227	1.01	26	0.43	Y	N	N	Y	N	Y	N	Y	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	25	150	Y	N
N	3.8	15.8	14.6	305	1.17	45	0.96	Y	N	N	Y	N	Y	N	Y	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	30	170	N	Y
N	4.47	8	13.8	175	1.05	23	0.77	Y	N	N	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	28	170	N	Y
N	4.06	7.1	14	216	1.11	18	0.79	N	Y	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	10	160	Y	N
Y	3.64	19.7	15.2	747	1.48	77	1.53	N	Y	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	8	140	Y	N
N	4.25	7.9	12.2	244	0.98	32	0.74	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	10	145	Y	N
N	2.89	7.4	11.3	347	1.06	31	1.14	Y	N	N	Y	N	Y	Y	N	Y	N	N	N	N	N	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	27	150	Y	N

S.no.	Name	Age	Sex	Mrd no.	DOA	DOD	Pain abdomen	Vomiting	Fever	Constipation	Abdominal distension	diabetes	CKD	CLD	CAD	TB	Malignancy	HTN	COPD	Previous laparotomy	h/o anastomotic leak	smoker	alcoholic	obese	coagulopathy	malnourished	tenderness	distension	guarding	rigidity	palpable mass	perforation	stoma closure	obstruction	ec fistula	malignancy	elective
50	SJ	18	F	1059820	21/3/21	04-06-2021	N	N	Y	N	Y	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	Y	N	Y	N	N	N	N	N	N	Y	N	Y
51	N	60	F	1065113	30/3/21	04-07-2021	Y	N	N	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N	N	N	N	N	Y	N	N	Y
52	K	40	M	965404	31/3/21	17/4/21	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	N	N	N	N	Y	N	Y
53	R	60	M	119863	28/10/20	11-06-2020	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N
54	P	54	F	1114557	29/5/20	21/6/20	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N
55	J	42	M	1180319	25/9/20	10-02-2020	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	Y	Y	N	N	N	N	Y	N	N	N
56	K	61	M	1178203	09-12-2020	10-01-2020	Y	Y	N	N	N	N	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y
57	P	56	M	1177312	21/9/20	10-04-2020	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	Y
58	SD	48	F	1152106	09-01-2020	10-01-2020	Y	Y	N	Y	Y	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	Y
59	T	67	M	1131927	28/9/20	10-04-2020	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y
60	MR	59	F	1193165	18/10/20	26/10/20	Y	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	Y	N	N	N	Y	N	N	Y	N	N	Y
61	VK	61	M	1188148	10-09-2020	21/10/20	N	N	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y

emergency	albumin	TLC	Hb	Platelet	INR	Urea	Creatinine	Handsewn anastomosis	Stapled anastomosis	jejunal site	ileal site	return of bowel sounds in 4 days	in 5-7 days	postop feed within 72 hrs	feed >72hrs	enteral feed	parenteral feed	suture site infection	wound dehiscence	bile in drain	bilious discharge from operative site	post op pain abdomen	post op fever	post op peritonism	post op tachycardia	post op prolonged ileus	post op ec fistula	Re-Exploration	re-exploration in 7 days	in 1-6 weeks	after 6 weeks	hospital stay for < 7 days	>7 days	Anastomotic Leak	time for anastomosis(mins)	operating time(mins)	return to work(< 7 days after	>7 after discharge
N	3.35	6.7	11.2	219	1.34	15	0.38	N	Y	N	Y	Y	N	Y	N	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	10	150	Y	N
N	2.94	4.1	5.6	129	1.05	22	0.51	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	N	7	130	Y	N
N	4.48	6.1	14.8	153	1	16	0.59	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	30	170	N	Y
Y	3.78	7	11	170	1.34	17	0.54	N	Y	N	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	10	140	Y	N
Y	2.6	10.5	9	359	1.44	51	0.98	N	Y	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	N	8	150	Y	N
Y	3.74	13.6	13.6	318	1.46	30	0.92	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	Y	N	7	170	N	Y
N	3.03	6.4	14.6	304	0.98	13	0.69	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	7	140	Y	N
N	4.52	10	11	218	1.03	32	0.64	N	Y	Y	N	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	7	155	N	Y
N	3.48	5.7	11.7	383	1.15	36	0.76	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	9	140	Y	N
N	3.74	9.2	13	326	1.05	17	0.69	Y	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	30	170	N	Y
N	4.07	8.1	14	152	1.1	20	0.64	N	Y	N	Y	N	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	10	140	Y	N
N	4.51	7.5	14.9	243	1	25	1.03	N	Y	N	Y	Y	N	Y	N	Y	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	10	150	Y	N

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No. BFUHS/2K21p-TH/ 5051 **Date** 20/4/2021

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Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 22.01.2021 has approved the plan of thesis of **Dr. Aditi Gupta,** a student of your college for **MS General Surgery** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
To study the outcome of stapler versus handsewn anastomosis in small intestine surgeries

Supervisor
Dr. Chiranjiv Singh Gill
Prof.,
Dept. of Surgery,
DMCH, Ludhiana.

Co-Supervisor
Dr. Ashvind Bawa
Assoc. Prof.,
Dept. of Surgery,
DMCH, Ludhiana.

The student has to submit the three copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

SP Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

1. ***If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.***
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examinations 31st May of the year of examination.*

TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

M.S.

in

Surgery

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES
FARIDKOT

November, 2019

Dr Aditi Gupta

DEPARTMENT OF SURGERY
DAYANAND MEDICAL COLLEGE AND HOSPITAL
LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	**TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES**
For the degree of	M.S. General Surgery
Name of the candidate	Dr Aditi Gupta
Supervisor	Dr. Chiranjiv Singh Gill, Professor, Department of Surgery, DMCH, Ludhiana
Co-supervisor	Dr.Ashvind Bawa, Associate Professor, Department of Surgery, DMCH, Ludhiana
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: In gastrointestinal surgery after resection of bowel loops, anastomosis of the bowel loops forms the main part of surgery. Single layer extra mucosal anastomosis is more commonly used because of the capacity to produce less tissue necrosis or luminal narrowing. Stapler technique is now commonly used by many surgeons. It is claimed that stapler anastomosis is more useful than the handsewn anastomosis for safety, easy accessibility, shorter duration of procedure and efficiency.

Aim of Study: To compare the outcome of stapler versus handsewn anastomosis small intestine surgeries

Materials & Methods: The study will be conducted on patients undergoing small intestine surgery which includes-

- Intestinal Obstruction
- Bowel Injuries
- Cancer
- Precancerous Polyps
- Bleeding
- Stricture

Clinical Significance: to reduce post-operative complications due to anastomotic leak and have better prognosis of surgery

Keywords: Gastrointestinal, anastomosis, handsewn, stapled, leak

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CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES"** exist in the Department of Surgery, DMCH, Ludhiana and will be provided to the candidate. We will see that the data being included in the thesis is genuine and is collected by the candidate herself under our supervision and guidance.

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5	TITLE OF THE TOPIC	**TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES**

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

An anastomosis becomes necessary when a segment of the gastrointestinal tract is resected during surgery and continuity needs to be restored.[1] A successful anastomosis needs a well- nourished patient with no systemic illness, no fecal or purulent contamination, gentle tissue handling, well- vascularised tissues, adequate hemostasis, and meticulous surgical technique besides other factors.[2-4] Important complications following intestinal anastomosis include anastomotic leak, bleeding, wound infection, prolonged functional ileus, especially in children. The two most commonly used techniques are handsewn anastomosis and stapler anastomosis. The aim of this prospective study is to observe the results of using stapler in comparison to handsewn anastomosis for wound infection and anastomotic leak within 1 month of anastomosis.[5]

Numerous surgical conditions require the resection of bowel segments and the creation of reliable anastomosis. As such, anastomotic techniques have been central to the development of modern surgical practice. Traditionally, a wide variety of suture materials have been used to create handsewn anastomosis. Although, surgical stapling devices have existed since the early 20th century, their use in routine gastrointestinal surgery has not been widespread until approximately 30 yrs ago, when their design became much more efficient and convenient. Today, stapled anastomosis is an integral part of most major abdominal surgeries. Numerous studies have compared the clinical and laboratory features of handsewn and stapler anastomosis techniques.

There has been a lack of studies comparing superiority in general surgeries of digestive tract tumors between stapler and handsewn anastomosis. Studies show that in ileocolic surgeries stapler anastomosis was associated with fewer leaks than handsewn anastomosis although there was no difference for stricture formation, anastomotic time, re-operation rate, mortality rate, or

intra-abdominal abscess formation. Stapler suturing shortened the operation time compared to conventional handsewn suturing. Shortening the operation time means reducing surgical trauma and intraoperative blood loss and also abating local infection and reducing the chance of surgical complications. Some studies claim that post-op complications are lesser with stapler anastomosis. Another study revealed that side-to-side stapled technique is conducive in decreasing complications of postoperative dysphagia and is helpful for improving pharyngoesophageal and anastomotic menometric function. There is a relative lack of reports on the functional recovery of the organ after surgery in patients with the digestive tract diseases.

The stapled procedure could be translated to the benefits of functional recovery or reduced complications via: consistent space of anastomosis; 'B' cross-stitch using titanium nails; the consistency of anastomosis and cutting may reduce the chance of infection due to manual operation and decrease the risk of pulling and clamping the jejunum, thus reducing jejunal damage.

6.2 REVIEW OF LITERATURE

Surgical stapling was first introduced by Hultlin 1908 but their use has grown since the introduction of new disposable instruments in the past 35years.

Surgical suture is a medical device used to hold body tissues together after an injury or surgery. It consists of a needle with an attached length of thread. Intestinal segments can be sewn together with various suture materials.[5]

The ideal suture material is one that causes minimal inflammation and tissue resection, while providing maximum strength during the lag phase of wound healing is yet to be discovered. Absorbable sutures include catgut and newer synthetics, e.g, polyglycolic acid (Biovek), polylactic acid, polydioxanone, polygalactin(vicryl), and caprolactone. Nonabsorbable sutures are made of special silk or synthetics like polypropylene, polyester, polyethylene glycol (prolene), and nylon.[6]

Mechanical stapling devices – surgical staples are used in place of sutures to close skin wounds, connect or remove parts of bowel or lungs.[6] Stapling is much faster, accurate, consistent than suturing by hand. In bowel and lung surgery, staples are primarily used because staple lines are less likely to leak.[7]

The technique was pioneered by a Hungarian surgeon, Humer known as the "father of surgical stapling".[8] Several flaws were associated with older instruments such as enormous weight about 5 kg, complex and cumbersome structure, difficulty of cleansing, time wasting necessity of refilling the clips.[9,10]

Modern surgical staplers are either disposable, made of plastic, or reusable, made of stainless steel. Both types are generally loaded using disposable cartridges. There are several surgical stapler designs in the market, intended for different types of staple placement. Some surgeons use disposable staplers that are fitted with disposable cartridges and used on a single patient. Others use reusable staplers made from stainless steel. In this case, a disposable cartridge is used, and the stapler is sterilized after use so that it can be used on another patient. Reusable staplers generate surgical waste, but energy is

required to sterilize them, so the net environment impact when compared to a disposable product is not very different. Although, most surgical staples are made of titanium, stainless steel is more often used in some skin staples and clips.In gastrointestinal surgery after resection of bowel loops, anastomosis of the bowel loops forms the main part of surgery. Seromuscular suture technique is the main stay of the gastrointestinal surgery which was described by Lembert in 1826.Single layer extra mucosal anastomosis is more commonly used nowadays which was described by Matheson of Aberdeen because of the capacity to produce less tissue necrosis or luminal narrowing which has replaced catgut and silk nowadays.[11]

The evolution of mechanical suture by stapler devices is a technological advancement which helps anastomosis of bowel loops with less tissue injury and decreased duration of procedure. It also decreases the anastomotic leak complication.[12] Stapler technique is now commonly used. It is more useful than the handsewn anastomosis for safety, easy accessibility, shorter duration of procedure and efficiency. Accurate approximation without tension and with a good blood supply is essential for suturing or stapling.[13-15]

Surgical Anatomy- The bowel wall is comprised of four layers: the mucosa, submucosa, muscularis propria, and serosa. The submucosa is the "strength" layer of the anastomosis and must be included in every suture pass. The vascular supply to the bowel is via the mesentery. The superior mesenteric artery gives rise to the arcuate system that supplies the vasa recta of the small intestine. The arcades are simple and primary in the proximal jejunum but increases in complexity in the more distal portions of the intestine. The vasa recta arises from the most peripheral arcades and do not intercommunicate. This configuration leaves the antimesenteric border of the bowel at the highest risk for the ischemia, especially if reconstructions are not centred to them.

If an anastomosis is constructed of on one side of the bowel, there will be a shorter distance for the blood supply to reach the mesenteric aspect of the anstomosis. However, the blood supply to reach the

antimesenteric aspect of the anastomosis must travel a considerably longer distance over the antimesenteric border of the bowel. That puts the antimesenteric aspect of the anastomosis at a much higher risk of ischemia. For this reason, surgeons prefer centering side-to-side and side-to-end anastomosis on the antimesenteric border of bowel, rather than off to one side, whenever possible, to minimize ischemia.

SUTURE TYPES- Practically, surgeons may select any type of sutures, so long as they adhere to the essential tenets of anastomoses. The ideal suture would provide adequate tensile strength throughout the healing process while minimizing local tissue reaction. Individual suture characteristics vary, but generally the typical absorbable sutures are used for bowel anastomosis maintain tensile strength for two to three weeks and are absorbed by hydrolysis after two to three months.

Non absorbable sutures maintain their tensile strength throughout the entire healing process. Common brands of braided absorbable sutures include Vicryl and Polysorb. A criticism of braided sutures is damage due to tissue drag. Common brands of monofilament absorbable sutures include Moncryl, Biosyn, PDS, Maxon. Monofilament sutures traverse tissue with minimal drag, though their tendency to slip requires additional knots when compared with braided sutures. Common non absorbable sutures include silk, nylon, and polypropylene.

STAPLERS- There are three standard types of surgical staplers used for bowel resection and reconstruction :

- Transverse anastomosis (TA) staplers are typically noncutting straight staplers that lay down several rows of staples. After stapling with a TA stapler, the specimen needs to be transected with scissors or a scalpel.
- Linear staplers, most commonly referred to as gastrointestinal anastomosis (GIA) staplers, are similar to the TA staplers but have an additional cutting mechanism for transaction. Several rows of staples are placed on either side of cut.

- End- to- end anastomosis (EEA) staplers are circular cutting staplers that place several rows of staples on both cut ends as well.

While the individual staples are almost always made of titanium, staplers come in a variety of configurations and lengths for open and laparoscopic procedures. Staplers can also accommodate different cartridges to handle different tissue thickness. Cartridges are preloaded with staples and color coded by the manufacturer to indicate the height of the staples. Typical staple heights range from 2mm for thin, vascular tissue (eg, mesentery) to 4.1 mm for thick tissue (eg, inflamed bowel/colon). The typical staple height used for the majority of bowel resection/ anastomosis procedure is 3.5 mm.[16]

Staplers were originally developed to address the perceived problem of patency(security against leakage of blood or bowel contents) in anastomoses in particular[17]. Surgery remains the major first-line treatment for GI tumors. An ideal anastomosis should fulfill the following criteria: it must be well vascularised, safe, tension-free and spillage from the operation field should be avoided[18]. The manual procedure has been used as an anastomotic method in digestive tract surgery in the past few years[19,20] . It is recognized that the stapler method generally shortens the total operating time and provides better access to difficult-to-reach areas[21].

The stapled procedure could be translated to the benefits of functional recovery or reduced complications via: consistent space of anastomosis; tight closure of anastomotic nails, type'B' cross-stitch using titanium nails[22].

6.3 AIMS AND OBJECTIVES OF THE STUDY

To study the outcome of stapler versus handsewn anastomosis in small intestine surgeries.

7. MATERIALS AND METHODS

This prospective study will be conducted in Dayanand Medical College and Hospital, Ludhiana on patients who will get admitted for small intestine surgeries from 1st Dec 2019 to 31st May 2021 and after that 1 month follow up upto 30th June 2021.

7.1 SOURCE OF DATA

Data shall be collected from patients who will undergo small intestine anastomosis during gastrointestinal surgery in the given time period will be taken for study considering the inclusion and exclusion criteria.

7.2 METHOD OF COLLECTION OF DATA

INCLUSION CRITERIA-

All patients undergoing handsewn or stapler anastomosis of small intestine

EXCLUSION CRITERIA-

- Patients who have received / receiving chemotherapy or radiotherapy
- Immunocompromised patients
- Ulcers due to inflammation of small intestine, Regional ileitis, Regional enteritis, Crohn's disease, Ulcerative colitis.

METHODS OF COLLECTION

The study will be conducted on patients undergoing small intestine anastomosis for intestinal obstruction, bowel injuries, cancer, precancerous polyps, bleeding, stricture, etc to study the outcome of handsewn versus stapler anastomosis in small intestine surgeries in terms of-

[a] Mean operating time(minutes)

[b]Return of bowel sounds

[c]Resumption of oral feeding

[d]Wound infection rate

[e] Anastomotic leak rate

[f] Anastomotic site bleeding

[g] Need for re-exploration

[h] Duration of hospital stay

[i] Return to work in days will be noted and data analysed.

PERIOD OF FOLLOW UP: 1 Month

DURATION OF STUDY: 1st Dec 2019 to 31st May 2021

OUTCOME: To study which anastomosis is more successful for small intestine surgeries.

STATISTICAL ANALYSIS: Data will be described in terms of range; mean ±standard deviation (± SD), median, frequencies (number of cases) and relative frequencies (percentages) as appropriate. Comparison of quantitative variables between the study groups will be done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test was used when the expected frequency is less than 5. A probability value (p value) less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows.

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PROFORMA

Sr. No. ___

Name Age Sex

MRD No. Date of Admission Date of Discharge

Chief Complaints:

Pain abdomen- Y / N

Vomiting- Y / N

Fever- Y / N

Constipation- Y / N

Abdominal distension- Y / N

Past History: Comorbidities

Diabetes- Y / N

CKD- Y / N

CLD- Y / N

CAD- Y / N

TB- Y / N

Malignancy- Y / N

HTN- Y / N

Chemotherapy- Y / N

Radiotherapy- Y / N

COPD- Y / N

Surgical History:

Any previous laparotomy – Y / N

Any h/o anastomotic leak - Y / N

Personal History:

Smoker- Y / N

Alcoholic- Y / N

Obese- Y / N

Coagulopathy- Y / N

Malnourished - Y / N

EXAMINATION-Per abdomen-

Tenderness- Y / N

Distension- Y / N

Gaurding- Y / N

Rigidity- Y / N

Palpable mass- Y/ N

INDICATION for surgery-

Perforation – Y / N

Stoma closure- Y / N

Obstruction - Y / N

Enterocutaneous fistula –Y / N

Malignancy- Y/N

TYPE OF SURGERY-

Elective / Emergency

INVESTIGATIONS-

Albumin-

TLC-

Hb-

Platelet-

INR-

Urea-

Creatinine-

OT FINDINGS-

Type of anastomosis:

Hand Sewn- Y / N

Stapled- Y / N

Site of anastomosis:

Jejunum- Y / N

Ileum- Y / N

Post op-

Time of Return of Bowel Sounds:

Within 4 days- Y / N

5 -7 days - Y / N

Post op Feeding :

Within 72 hrs- Y / N

After 72hrs - Y / N

After 120 hrs- Y / N

Enteral feed- Y / N

Parenteral feed- Y / N

Wound complications:

Suture site infection- Y / N

Wound dehiscence- Y / N

Anastomotic leak:

Bile in drain- Y / N

Bilious discharge from operative site – Y / N

Pain abdomen - Y/ N

Fever post op - Y / N

Peritonism - Y / N

Tachycardia - Y / N

Prolonged ileus - Y / N

Enterocutaneous fistula- Y / N

Re-exploration: Y / N

In 1 week- Y / N

Between 1-6 weeks- Y / N

After 6 weeks- Y/N

Duration of hospital stay:

< 7 days – Y / N

> 7 days – Y / N

Anastomotic Leak- Y / N

Time for Anastomosis (mins)-

Operating Time (mins)-

Return to work <7 days after discharge- Y / N

> 7 days – Y / N

Signature of Candidate **Signature of Supervisor**

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o,

S/o..... .....am willing to participate in the study **"TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES"**

The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

....

Signature of the Witness Signature of the patient

Name:

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी _____

इस शोधकार्य **"TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES"** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"TO STUDY THE OUTCOME OF STAPLER VERSUS HANDSEWN ANASTOMOSIS IN SMALL INTESTINE SURGERIES" ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

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ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

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ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ